

The University of Chicago

CONODONTS FROM A BUSHBERG-HANNIBAL
HORIZON IN OKLAHOMA

A DISSERTATION SUBMITTED TO THE FACULTY OF THE DIVISION OF THE
PHYSICAL SCIENCES IN CANDIDACY FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

DEPARTMENT OF GEOLOGY AND PALEONTOLOGY

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By
CHALMER L. COOPER

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CONODONTS FROM A BUSHBERG-HANNIBAL HORIZON IN OKLAHOMA¹

CHALMER L. COOPER

ABSTRACT—A prolific conodont fauna is described from a thin clay shale between the Woodford and Welden formations (lower Mississippian) in the eastern part of the Arbuckle Mountains. Most of the forms are new. About one-fourth of them are described species, a preponderance of which are found in the Bushberg and Hannibal formations of Missouri. The superjacent Welden limestone of St. Louis age is briefly described for the first time, although it is shown on the revised map of the Arbuckle Mountains, published in 1931 by the Oklahoma Geological Survey.

THE Mississippian sections of Oklahoma have long been a subject of differences of opinion. There are four such sections, each more or less differentiated in lithologic character, and consequently in formational composition. These sections are usually differentiated by reference to the uplift in which they occur,—the Ozark Upland, the Ouachita Mountains, and the southern and eastern portions of the Arbuckle Mountain uplift. For the most part, the formations are limestones and shales.

The Ozark section includes the Chattanooga shale, the St. Joe and Boone limestones, and the Moorefield shale of the lower and middle Mississippian and the Batesville sandstone, Fayetteville shale, Wedington sandstone and Pitkin limestone of the Chester series (upper Mississippian). This section, averaging about 600 feet in thickness, is found in northeastern Oklahoma, northwestern Arkansas, and southwestern Missouri.

Most stratigraphers include the immensely thick clastics of the Ouachita Mountains, known as the Stanley shale and

Jackfork sandstone, in the Mississippian. Miser (1934), David White (1934), and others, however, would place these formations in the lower part of the Pennsylvanian, correlative, in part, with the Atoka formation exposed to the north and west. If this separation is made, the thickness of the system in eastern Oklahoma and western Arkansas is greatly reduced, leaving less than 500 feet of beds in the upper and middle divisions of the Arkansas novaculite. The latter are correlative with the Woodford formation to the west and the Chattanooga shale to the east and northeast (Cooper, 1935, p. 311). Beds of "Caney" (Johns Valley) shale, including those of the type locality in Johns Valley in the northwestern part of Pushmataha County, Oklahoma, are now considered Pennsylvanian in age by Ulrich (1924), Harlton (1934, 1938), and others.

The Arbuckle Mountains contain two somewhat contrasting Mississippian sections. On the south flank of the uplift the section includes, in upward order, the Woodford formation, Sycamore limestone, and Caney shale (not the same as the type Caney, for the latter has been correlated with part of the overlying Springer forma-

¹ Research directed by Carey Croneis at Walker Museum, University of Chicago, where the type specimens are deposited.

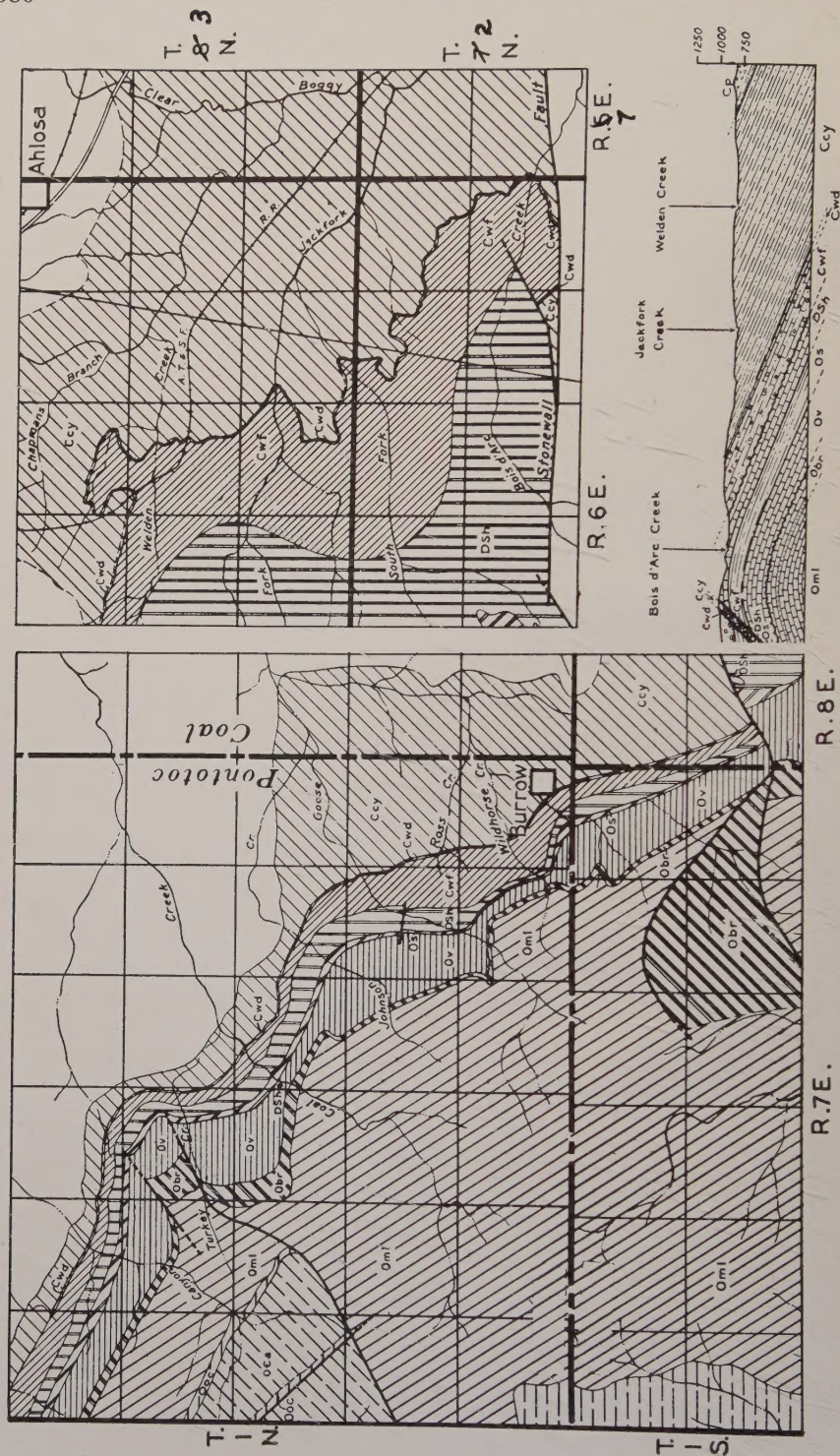


FIG. 1.—Map showing outcrops of the Welden limestone and associated formations in the east-central portion of the Arbuckle mountains. Cp—Pennsylvanian undifferentiated; Ccy—Caney shale; Cwd—Welden limestone; Oml—McLish formation; Ovr—Viola limestone; Obr—Bromide formation; Dsh—Woodford shale; Hs—Hunton group; Os—Sylvan shale; Ooc—Oil Creek formation; Oca—Arbuckle limestone. (After Oklahoma Geol. Survey, Bull. 55, pl. 1.)

tion of Pennsylvanian age, into which the Mississippian Caney grades almost imperceptibly). The Caney shale of the Arbuckle Mountains has been shown to be close to St. Louis in age by Girty (1909), but Ulrich (1924, fig. 2) has correlated the shale of the type section in the Ouachitas with the Pottsville, renaming it the Johns Valley shale. The Mississippian section is approximately 1,500 feet thick on the south flank of the Arbuckles.

On tracing these formations toward Ada, which is on the northeast side of the uplift, the Sycamore, which has a maximum thickness of 750 feet, thins and finally disappears a few miles south of Sulphur. This limestone is believed to be Kinderhook in age, and very little younger than the Woodford below. Another limestone of very different character is found between the Woodford and Caney a few miles northeast of the point where the Sycamore disappears. This is the fossiliferous limestone which I called the Welden on the geologic map of the Arbuckle Mountains published by the Oklahoma Geological Survey in 1931 (see Decker and Merritt, 1931, pl. 1). This limestone was called Sycamore by Morgan (1924, pp. 48-50), who erroneously correlated this massive 2-foot bed with the thick, sandy limestone of Kinderhook age on the south side of the Arbuckles. Girty and I collected a considerable megafauna from the Welden at its type locality in 1929. On the basis of these fossils Girty (unpublished manuscript) correlated the Welden with the crinoidal limestone of Boone age (Chappel formation, see Sellards, 1932) below the Barnett shale (see Roundy and others, 1926) in San Saba County, Tex. He concluded that, although the two faunas are similar to each other, they are not closely related to any known Mississippian faunas of outlying regions. In his discussion of the collections made in 1929, Girty classed as Sycamore the fauna collected from lower Caney limestone layers or lenses in sec. 2, T. 2 N., R. 6 E., Oklahoma, and other localities in the eastern part of the Arbuckle uplift, thereby concluding that the Sycamore is younger than the Welden by reason of superposition of the beds in San Saba County, Tex. For the same reason he considered the Sycamore as a faunal unit

of the Caney. I have found both lithologic and faunal evidence (Cooper, 1926, pp. 22-25) for placing the type Sycamore in the Kinderhook (Chouteau), thus allying this formation closely to the Woodford. Girty's conclusions, based on the mistaken identity of the beds in the lower Caney, reverses the relative ages assigned to the Sycamore and Welden. This same correlation has been expressed by Hyatt (1936, p. 958).

Subsurface information on this question is inconclusive. In the Fitts and Jesse pools the succession downward is Caney, "Mayes," Welden, and Woodford. In the Ardmore basin south of the Arbuckles the succession is Caney, Sycamore (type), and Woodford. In the Llano region of Texas the downward succession is Marble Falls (Pennsylvanian), Barnett (=St. Louis), Chappel (=Boone), and Ellenberger (Ordovician). The Chappel limestone is only a few feet thick at the outcrop, but according to Sellards (1932) underground north and west of the Llano Uplift the formation is "absent or ranging from a thin stratum to 150 feet."

Thus, we have two limestones that are lithologically dissimilar and not very closely related faunally, occurring at apparently the same stratigraphic horizon (below the Caney and above the Woodford) at two not very widely separated localities. Since I consider the Welden younger than the type Sycamore, and since some elements (*Endothyra*, etc.) of the microfauna (other than conodonts) from the shale below the Welden may place a part of this thin deposit as high as Salem, the Welden may even prove to be as young as St. Louis.

WELDEN LIMESTONE

The Welden limestone is a buff to blue-gray, massive, argillaceous limestone which is exposed on the north and south sides of the Franks graben, a few miles south of Ada, Okla. The known outcrops are some 20 miles in length, but well cuttings show that the limestone is somewhat more widespread (Hyatt 1936, fig. 2). The maximum exposed thickness is 2 feet, measured in the railroad cut in sec. 27, T. 3 N., R. 6 E. This is considered the type locality because it is the best known exposure and Welden Creek crosses the outcrop in the same section,

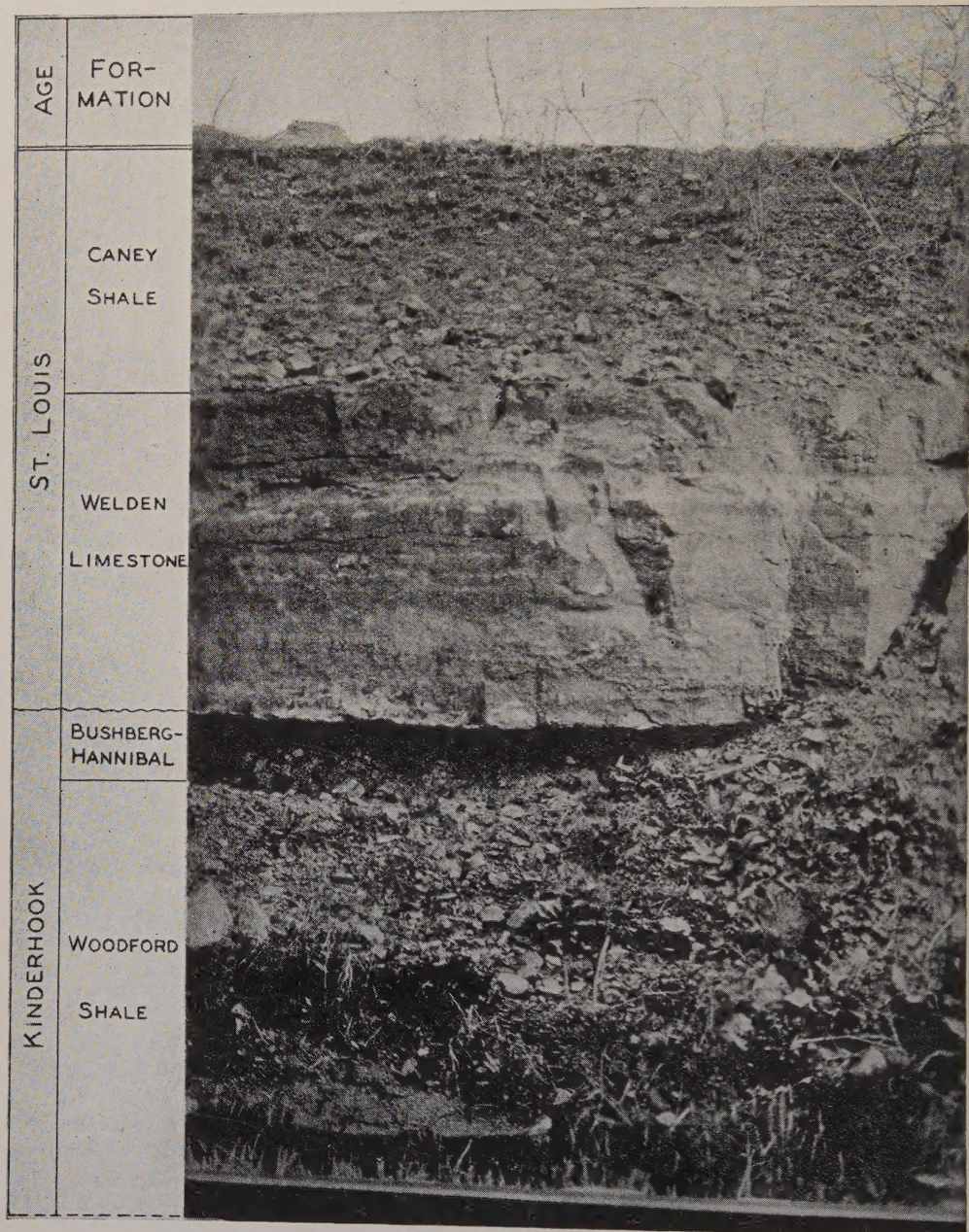


FIG. 2.—View of the type locality of the Welden limestone, showing the position of the Bushberg-Hannibal horizon and the correlation of the beds with the Mississippi valley section.

about 500 yards to the north (fig. 1). Girty has recognized 68 species of megafossils from the limestone.

PRE-WELDEN HORIZON

Interesting information concerning this section is revealed by a detailed examina-

tion of the thin clay shale zone, less than a foot thick, below the Welden limestone. The clay weathers buff to yellowish brown in color and contains a zone of concretion-like nodules in the upper part. This horizon has a thin, slightly sandy, glauconitic zone at the top. The clay rests on a dark-gray, blocky shale, 18 inches thick, such as is common at many horizons in the Woodford shale of this vicinity. Next below the gray shale is found the extremely bituminous black fissile shale that is so characteristic of the Woodford formation and Chattanooga shale over wide areas. The following section describes the beds shown in figure 2.

SECTION IN RAILROAD CUT, SEC. 27, T. 3 N.,
R. 6 E., OKLAHOMA

	Feet	Inches
<i>Caney shale</i>		
7. Shale, black to gray, carbonaceous, thin-bedded		
<i>Welden limestone</i>		
6. Limestone, massive, buff to blue-gray, argillaceous, fossiliferous.....	2	0
<i>Bushberg-Hannibal horizon</i>		
5. Shale, clay, gray.....		1.5
4. Limestone nodules and shale		3.5
3. Shale, clay, yellow, non-bedded.....		6
<i>Woodford shale</i>		
2. Shale, blocky, gray, poorly bedded, glauconitic at top	1	6
1. Shale, black, fissile, weathering into small thin plates		

The northernmost exposure is located in the SE $\frac{1}{4}$ sec. 20, T. 3 N., R. 6 E., from which it outcrops in a sinuous, more or less interrupted line to the fault marking the north edge of the Franks graben in sec. 12, T. 2 N., R. 6 E. The outcrop is found again in sec. 7, T. 1 N., R. 7 E., from which it has been traced to the center of sec. 7, T. 1 S., R. 6 E., in which the Welden limestone is not present.

SECTION IN THE NW $\frac{1}{4}$ SEC. 2, T. 2 N.,
R. 6 E., OKLAHOMA

	Feet	Inches
<i>Caney shale</i>		
9. Shale, mostly concealed		
8. Limestone, brown, very platy and brittle, slightly fossiliferous.....		2
7. Shale, brown.....	4	0

6. Limestone, bluish-gray, concretionary.....	± 1	6
5. Shale and clay, yellow to brown, blocky, somewhat sandy in lower part, <i>Lingula</i>	8	4
4. Limestone, cream to light buff, lenticular, <i>Goniatites</i> , <i>Caneyella</i> , etc.....	$\pm$	10
<i>Hannibal-Bushberg horizon</i>		
3. Shale, green, sandy, glauconitic, nodular at base, conodonts.....		11
<i>Woodford shale</i>		
2. Shale, bluish-gray, blocky, nodular in upper part...	1	0
1. Shale, black, fissile.....		

MICROFAUNA

About seven phyla are represented in the microfauna of the clay shale zone. These include Foraminifera, holothurians, echinoid spines, corals, bryozoans, nepionic brachiopods, ostracodes, and conodonts. The ostracodes and conodonts are by far the most prolific, the ostracodes being represented by a large number of individuals but a small number of species. The conodonts make up the most striking assemblage of these forms encountered in my experience.

The accompanying plates of these interesting fossils from this horizon show more than 360 forms, representing 256 species and 34 genera. Almost half of the species are bryantodids or polygnathids. Other common forms include the genera *Gnathodus*, *Hindeodella*, *Ligonodina*, *Prioniodus*, *Siphonognathus*, and *Spathodus*, which are represented by 9 to 27 species each.

As remarkable as the great number and variety of forms is their excellent preservation. Some are opaque, but most forms are translucent. Some species are so preserved that they are almost transparent and appear as though constructed of cellophane, giving the appearance of artificiality. The internal structure is revealed in great detail in the transparent forms.

CORRELATION

The faunal chart lists 105 pre-Welden conodont species which have been described from other formations. More than half of these (63 species) are found in the Hannibal shale (33 species) or Bushberg sandstone (36 species) which occur in the Kinderhook

group, below the Chouteau limestone and above the Glen Park formation, in the type Mississippi Valley section as represented in northeastern and southeastern Missouri (Moore, 1928, fig. 2). Only 6 species occur in both the Hannibal shale and Bushberg sandstone. Eleven species from the underlying Grassy Creek shale have been recognized in the pre-Welden shale. A relatively large number of forms (23 species) are found in the pre-Welden shale and also in the upper New Albany shale, Chattanooga, Woodford, or equivalent horizons. The chart shows that the distribution of species in these formations is rather uniform, whereas more than half of the Hannibal species are polygnathids or *Polygnathus*-like forms. It is also interesting to note that the Carboniferous of Russia is represented by 4 species and that the Carboniferous of Scotland is represented by 3 species. A most

interesting aspect of the fauna is the occurrence of 10 species reported by Branson and Mehl (1938) from the Chouteau limestone near Danville, Missouri.

On the data obtained from the conodonts, the pre-Welden shale is believed to be middle Kinderhook in age. It is separated from the Welden by a hiatus representing the upper Kinderhook and most, if not all, of the Osage group of the type section. This interval includes the Sycamore limestone and the Boone formation, which are well-developed units representing a maximum of over 1,000 feet of strata elsewhere in Oklahoma.

The species of conodonts here described were all collected from the pre-Welden shale, overlying Woodford beds, in the outcrop area mentioned near Ada, in south-central Oklahoma.

CORRELATION OF MISSISSIPPIAN FORMATIONS OF OKLAHOMA, MISSOURI, AND TEXAS

Age				Type Section	Missouri	Northeastern Oklahoma	South-central Oklahoma	Southern Oklahoma	San Saba County, Texas	
MISSISSIPPIAN	Upper	Chester		Chester forma-tions	Chester forma-tions	"Mayes", ?	Pitkin ls. Wedington ss. Fayetteville sh. Batesville ss.	<i>absent</i>	<i>absent</i>	Barnett shale
				Ste. Genevieve	Ste. Genevieve		<i>absent</i>	Caney sh.	Caney sh.	
	Middle	Meramec		St. Louis	St. Louis		Moorefield sh.			
				Salem	Salem	<i>absent</i>	<i>absent</i>			
				Warsaw	Warsaw	Boone fm.	Spring Creek member	Welden ls.	<i>absent</i>	Chappel fm.
		Osage		Keokuk	Keokuk					
				Burlington	Burlington					
			Lower	Kinderhook		Fern Glen	Fern Glen	St. Joe member (Present)	<i>absent</i>	Sycamore
		Chouteau			Chouteau					
		Hannibal			Bushberg Hannibal	<i>absent</i>	Pre-Welden sh.	<i>absent</i>	<i>absent</i>	
		Glen Park			Glen Park		<i>absent</i>			
		Louisiana			Louisiana					
		Chattanooga	Grassy Creek	Chattanooga sh. Sylamore	Woodford sh.	Woodford fm.				
	PRE-MISS.			Upper Devonian formations	Devonian-Ordovician	Ordovician-Pre-Cambrian	Hunton group	Hunton group	Ellenberger ls.	

SYSTEMATIC DESCRIPTIONS

Genus *ANGULODUS* Huddle, 1934*ANGULODUS* cf. *SPISSUS* Huddle

Plate 47, figure 78

Angulodus spissus HUDDLE, 1934, Bull. Am. Paleontology, vol. 21, p. 264, pl. 10, fig. 7.

Bar wide, heavy, aboral edge sharp, denticles large and round, with short, smaller ones between.

Hypotype, Walker Museum, Univ. Chicago, no. 38801.

Genus *APATOGNATHUS* Branson and Mehl, 1934*APATOGNATHUS*? *VARIANS*

Branson and Mehl

Plate 47, figure 30

Apathognathus varians BRANSON and MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 201, pl. 17, figs. 1-3.

A very closely arched form, which possibly belongs to this genus. Denticles equal in size; cusp slightly incurved.

Hypotype, Walker Museum, Univ. Chicago, no. 38802.

Genus *BRYANTODUS* Ulrich and Bassler, 1926*BRYANTODUS FLEXUS*

Branson and Mehl

Plate 43, figures 27, 28

Bryantodus flexus BRANSON and MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 284, pl. 23, figs. 7, 8.

Bar strongly arched; denticles fused and strongly inclined; aboral projection poorly developed.

Hypotype, Walker Museum, Univ. Chicago, no. 38803.

BRYANTODUS COLOBUS Cooper, n. sp.

Plate 43, figures 18, 19

A form intermediate between *Bryantodus* and *Subbryantodus* in that the medial flange on the aboral side is poorly developed, but referred to the former because of the ridge on each side of the bar. Denticles and cusp wide and very short; bar arched.

Holotype, Walker Museum, Univ. Chicago, no. 38804.

BRYANTODUS CURTUS Cooper, n. sp.

Plate 43, figures 16, 17

Bar thick, with a heavy, distinct ridge

on inner side, strongly arched and strongly curved laterally; denticles nearly discrete and gradually tapering; cusp wide, massive.

Holotype, Walker Museum, Univ. Chicago, no. 38805.

BRYANTODUS MACER Branson and Mehl

Plate 43, figures 20, 21, 31, 32

Bryantodus macer BRANSON and MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 283, pl. 23, fig. 4.

Bar arched; curved laterally, aboral projection outlines slit-like escutcheon; anterior denticles wider and heavier than posterior ones; cusp slender and not much larger than denticles on each side.

Hypotype, Walker Museum, Univ. Chicago, nos. 38806, 38807.

BRYANTODUS MUNDUS Branson and Mehl

Plate 46, figures 25, 26

Bryantodus mundus BRANSON and MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 284, pl. 23, fig. 9.

An extremely large species with heavy, sharp denticles and cusp; bar arched and curved laterally.

Hypotype, Walker Museum, Univ. Chicago, no. 38808.

BRYANTODUS ORTHUS Cooper, n. sp.

Plate 43, figures 33, 34

Tooth small; bar arched; denticles short and upright; cusp inclined with respect to denticles on each side; escutcheon large and aboral projections well formed.

Holotype, Walker Museum, Univ. Chicago, no. 38809.

BRYANTODUS PLANUS Branson and Mehl

Plate 43, figures 29, 30

Bryantodus planus BRANSON and MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 284, pl. 23, fig. 8.

Bar thin, strongly arched; anterior denticles short, posterior ones longer and more inclined; cusp wide and blade-like; escutcheon well defined by aboral projection.

Hypotype, Walker Museum, Univ. Chicago, no. 38810.

BRYANTODUS SCOLOPS Cooper, n. sp.

Plate 43, figure 24

Bar narrow, arched; denticles short and sharp; cusp much longer and heavier than

the denticles; aboral projection well developed.

Holotype, Walker Museum, Univ. Chicago, no. 38811.

BRYANTODUS TYLUS Cooper, n. sp.

Plate 43, figures 45, 46

Bar strongly curved and arched, lateral ridges prominent, with large nodes on inner side of oral surface; denticles wide, pointed and fused; cusp but little longer than denticles.

Holotype, Walker Museum, Univ. Chicago, no. 38812.

Genus *CHIROGNATHUS* Branson
and Mehl, 1934

CHIROGNATHUS NEOSSA Cooper, n. sp.

Plate 47, figure 81

Base flaring, heart-shaped in outline; large denticle flat, outer edge sharp; small denticle round and slender.

Holotype, Walker Museum, Univ. Chicago, no. 38813.

Genus *DINODUS* Cooper, n. gen.

Base long, slender, triangular in cross-section, aboral edge grooved; denticles closely spaced, small, and greatly inclined; terminal (posterior?) end widened, sub-circular, with inclined denticles continuing around the margin, giving the appearance of a whirl. Anterior end unknown.

Genotype, *Dinodus leptus* Cooper, n. sp.

DINODUS LEPTUS Cooper, n. sp.

Plate 47, figures 63, 75, 76

Bar triangular in cross section, aboral edge slightly grooved; denticles short, thin, and inclined; termination rounded; surface finely pitted.

Holotype, Walker Museum, Univ. Chicago, no. 38815; paratypes, nos. 38814 and 38816.

Genus *DRYPHENOTUS* Cooper, n. gen.

Plate leaf-shaped in outline but asymmetrical, oral surface very punctate; the anterior edge of the larger side of the plate has a ridge or row of prominent nodes at or nearly at right angles to the carina, posterior end pointed. Bar well developed, denticles distinct but often fused for most

of their length. Escutcheon occupies the entire aboral side of the plate, and is traversed by a deep, narrow groove beneath the carina.

Genotype, *Dryphenotus punctatus* Cooper, n. sp.

DRYPHENOTUS PUNCTATUS Cooper, n. sp.

Plate 41, figures 42, 43; plate 42,
figures 10, 11

Plate asymmetrical, oral surface covered with prominent nodes, row on left side at right angles to carina; bar wide, thin; denticles distinct but fused except for their pointed tips.

Holotype, Walker Museum, Univ. Chicago, no. 38818; paratype, no. 38817.

DRYPHENOTUS LITUS Cooper, n. sp.

Plate 42, figures 34, 35

Length and breadth of plate equal, carina and minor ridge almost at right angles, straight and sharp; no prominent denticles or nodes.

Holotype, Walker Museum, Univ. Chicago, no. 38819.

DRYPHENOTUS MACROLOBUS Cooper, n. sp.

Plate 41, figures 48, 49; plate 42,
figures 45, 46

Plate irregular in outline, faintly pustulose, but ridges prominently so; carina depressed posteriorly in a strong regular curve to meet the tip of the plate; row of nodes on right lobe at right angles to carina.

Holotype, Walker Museum, Univ. Chicago, no. 38821; paratype, no. 38820.

DRYPHENOTUS OXYS Cooper, n. sp.

Plate 42, figures 12, 13

Plate asymmetrical, nodes prominent, row on widest side of plate meeting carina at an acute angle; bar thin, wide, and slightly curved.

Holotype, Walker Museum, Univ. Chicago, no. 38822.

Genus *ELICTOGNATHUS* Cooper, n. sp.

Blade thin, almost semicircular in outline, base or aboral edge flat and slightly curved, one side narrow and plain, the opposite side wide and with a row of small denticles on its turned-up edge, which parallels the row

of major denticles. One end of the blade is twisted through 90 degrees, joining the wide lateral ridge. This curved portion is also denticulated and is a regular continuation of the main row of denticles. Surface very finely pitted; escutcheon small.

Remarks.—This genus differs from *Solenognathus* in that it does not possess either major or minor cusps, has a poorly developed escutcheon and has no lateral ridges as such, but the denticles rise from a plate-like base.

Genotype, *Elictognathus bialata* (Branson and Mehl)

ELICTOGNATHUS BIALATA (Branson and Mehl)

Plate 45, figures 1, 2

Solenognathus bialata BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 273, pl. 22, fig. 11.

Tooth delicate, both plate and blade thin; largest denticles in center and grading to smaller ones at each end, giving a semi-circular outline; aboral surface flat and smooth.

Hypotype, Walker Museum, Univ. Chicago, no. 38823.

Genus *EUPRIONIODINA* Ulrich and Bassler, 1926

EUPRIONIODINA APHANES Cooper, n. sp.
Plate 46, figures 3, 16

Bar wide with short, slender, completely fused denticles; cusp wide, sharp-edged fore and aft, and inclined sharply forward; projection long and slender with short, fused denticles; escutcheon deep and prominently flaring.

Holotype, Walker Museum, Univ. Chicago, no. 38824; paratype, no. 38825.

EUPRIONIODINA? *ASEMA* Cooper, n. sp.
Plate 46, figure 4

Bar missing; cusp flat and sharp-edged; projection wide, with denticles indistinct because completely fused.

Holotype, Walker Museum, Univ. Chicago, no. 38826.

EUPRIONIODINA GRACILIS Branson and Mehl

Plate 46, figure 14

Euprioniodina gracilis BRANSON AND MEHL,

1934, Missouri Univ. Studies, vol. 8, p. 209, pl. 15, fig. 18.

Bar narrow, denticles completely fused; cusp wide, projection at right angles to bar with denticles at an acute angle and fused.

Hypotype, Walker Museum, Univ. Chicago, no. 38827.

EUPRIONIODINA ISA Cooper, n. sp.
Plate 47, figure 66

Bar thin with closely-spaced, sharp-pointed, flat denticles of equal size; cusp wide.

Holotype, Walker Museum, Univ. Chicago, no. 38828.

Genus *FALCODUS* Huddle, 1934

FALCODUS CONFLEXUS Huddle

Plate 47, figures 26, 34, 42, 43, 45, 46, 52

Falcodus conflexus HUDDLE, 1934, Bull. Am. Paleontology, vol. 21, p. 274, pl. 7, fig. 6.

Palmatodella ultima BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 292, pl. 23, fig. 21.

Bar wide at posterior end, where the longest denticles are located; cusp short and sharp-edged; projection denticulated like bar.

Hypotypes, Walker Museum, Univ. Chicago, nos. 38829–38835.

FALCODUS FRAGOSUS (E. R. Branson)

Plate 47, figures 17, 24, 33, 35, 53

Palmatodella fragosa? E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 333, pl. 27, figs. 2, 4–6.

Fragments of this form have been shown by Huddle to be distinctly different from *Palmatodella*.

Hypotypes, Walker Museum, Univ. Chicago, nos. 38836–38840.

FALCODUS TRYPPERUS Cooper, n. sp.
Plate 47, figure 25

Tooth fragmentary, but the essential parts, the cusp and the denticulated projection, are present, the latter twisted into a plane at right angles to the bar and the round, somewhat spaced denticles directed upward,

Holotype, Walker Museum, Univ. Chicago, no. 38841.

Genus GNATHODUS Pander, 1856

GNATHODUS BILINEATUS Roundy

Plate 42, figures 59, 60

Gnathodus bilineatus ROUNDY, 1926, U. S. Geol. Survey, Prof. Paper 146, p. 13, pl. 3, figs. 10 a-c.

Plate irregular in outline, one side wider than the other, the narrow side carrying a row of nodes equal in height to those on carina; bar wide, thin, and finely denticulated.

Hypotype, Walker Museum, Univ. Chicago, no. 38844.

GNATHODUS ISOMECEs Cooper, n. sp.

Plate 42, figures 61, 62

Plate as wide as long, unequally divided by carina; entire surface, except margins, nodular; bar wide and finely denticulated.

Holotype, Walker Museum, Univ. Chicago, no. 38845.

GNATHODUS LIUS Cooper, n. sp.

Plate 42, figures 71, 72

Plate smooth except for a few nodes on the highest part of aboral surface, asymmetrical; bar wide, thin, and finely denticulated.

Holotype, Walker Museum, Univ. Chicago, no. 38846.

GNATHODUS LONCOTUS Cooper, n. sp.

Plate 42, figures 65, 66

Plate longer than wide, asymmetrical, sharply pointed on the posterior end, narrow side with two sharp denticle-like protuberances on aboral surface; blade wide, thin, and finely denticulated.

Holotype, Walker Museum, Univ. Chicago, no. 38847.

GNATHODUS MOSQUENSIS Pander

Plate 41, figures 23-25, 30-32;

plate 42, figures 75, 76

Gnathodus mosquensis PANDER, 1856, Monographie der fossilen Fische des silurischen Systems der russisch-baltischen Gouvernements, St. Petersburg, p. 34, pl. 2A, figs. 10 a-c.

Polygnathus (Gnathodus) mosquensis (Pander) HINDE, 1879, Geol. Soc. London, Quart. Jour., vol. 35, p. 342, pl. 9, figs. 2-4.

Gnathodus delicatulus BRANSON AND MEHL, 1938, Missouri Univ. Studies, vol. 13, no. 4, pt. 2, p. 145, pl. 34, figs. 25-27.

Described by Pander from the Mountain limestone of Russia and recognized by Hinde in the Carboniferous of Scotland, this genus was first definitely recognized in North America by Roundy. The figured specimens are identical with the European form in general shape, outline, dentition, and plate characteristics.

Hypotypes, Walker Museum, Univ. Chicago, nos. 38848-38850.

GNATHODUS PARALLELUS Cooper, n. sp.

Plate 42, figures 73, 74

Plate divided unequally; right side narrow and parallel to carina, opposite side flaring, surface nodose; bar thin and finely denticulated.

Holotype, Walker Museum, Univ. Chicago, no. 38851.

GNATHODUS PERPLEXUS Branson and Mehl

Plate 42, figures 47-50

Gnathodus perplexus BRANSON AND MEHL, 1938, Missouri Univ. Studies, vol. 13, no. 4, pt. 2, p. 145, pl. 34, fig. 24.

Short lobe of plate much wider than opposite side, faintly pustulose, with a row of larger nodes along anterior edge almost normal to carina; narrow lobe topped by a row of nodes parallel to carina; bar wide and very finely denticulated.

Hypotypes, Walker Museum, Univ. Chicago, nos. 38842, 38843.

GNATHODUS STINUS Cooper, n. sp.

Plate 41, figures 40, 41

Plate very small, narrow, longer than wide, oral surface nodular; blade about two times as long as plate, wide, thin, with numerous distinct denticles.

Holotype, Walker Museum, Univ. Chicago, no. 38852.

GNATHODUS TEXANUS (Roundy)

Plate 41, figures 26, 27

Polygnathus texanus ROUNDY, 1926, U. S. Geol. Survey, Prof. Paper 146, p. 14, figs. 13 a, b.

Plate wide, leaf-shaped, nodes on oral surface; escutcheon occupies entire aboral surface.

Hypotype, Walker Museum, Univ. Chicago, no. 38853.

GNATHODUS TYPICUS Cooper, n. sp.

Plate 42, figures 77, 78

Plate small, pointed, asymmetrical, right side very narrow, nodose; bar thin, wide, and finely denticulated, teeth free at tips.

Holotype, Walker Museum, Univ. Chicago, no. 38854.

Genus HINDEODELLA Ulrich and

Bassler, 1926

HINDEODELLA ACULEATA Huddle

Plate 46, figure 36

Hindeodella aculeata HUDDLE, 1934, Bull. Am. Paleontology, vol. 21, p. 226, pl. 4, figs. 19-21; pl. 5, figs. 2, 3.

Bar thin and narrow, sharp-edged on aboral side; denticles alternating in size, one large to four small ones.

Hypotype, Walker Museum, Univ. Chicago, no. 38855.

HINDEODELLA ACUTA Branson and

Mehl

Plate 46, figures 15, 23, 29

Hindeodella acuta BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 196, pl. 14, figs. 8, 10.

Bar wide, denticles deeply "inserted," closely crowded, alternating in size; cusp much larger than denticles, inclined backward; anterior termination distinctly incurved and denticulated like the bar.

Hypotypes, Walker Museum, Univ. Chicago, nos. 38856-38858.

HINDEODELLA ANOMALODA Cooper, n. sp.

Plate 46, figure 27

Hindeodella sp. BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, pl. 14, fig. 14.

Bar narrow; denticles inserted, of various sizes, irregularly spaced, and standing in a nonuniform row; cusp but little larger than largest denticles; anterior termination long and incurved.

Holotype, Walker Museum, Univ. Chicago, no. 38859.

HINDEODELLA DELICATULA

Branson and Mehl

Plate 46, figure 33

Hindeodella delicatula BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 280, pl. 22, fig. 29.

Bar very slender, delicate, and slightly bowed; denticles alternating in size, in-

serted and inclined; cusp not much larger than denticles, posterior end terminated by a large denticle.

Hypotype, Walker Museum, Univ. Chicago, no. 38860.

HINDEODELLA ECHINATA E. R. Branson

Plate 47, figures 31, 77

Hindeodella echinata E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 324, pl. 28, fig. 17.

Bar slightly bowed; denticles irregular in size, with final denticle greatly produced; cusp small; projection small and slightly curved.

Hypotypes, Walker Museum, Univ. Chicago, nos. 38861, 38862.

HINDEODELLA ELONGATA Huddle

Plate 46, figure 26

Hindeodella elongata HUDDLE, 1934, Bull. Am. Paleontology, vol. 21, p. 288, pl. 5, figs. 5, 6.

Bar slender; teeth inserted, alternating in size, and closely crowded; cusp small and inclined; anterior projection long and straight from bar.

Hypotype, Walker Museum, Univ. Chicago, no. 38863.

HINDEODELLA GLADIOLA E. R. Branson

Plate 46, figures 24, 25

Hindeodella gladiola E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 324, pl. 28, fig. 18.

Bar slender and straight to slightly curved; denticles closely crowded and inserted. Figure 25 shows posterior development.

Hypotypes, Walker Museum, Univ. Chicago, nos. 38864, 38865.

HINDEODELLA? HAMATA Branson

and Mehl

Plate 47, figures 79, 80

Hindeodella hamata BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 279, pl. 22, figs. 24, 31.

Bar wide, ridged, with alternating long, large and short, thin denticles, posterior ones directed backward.

Hypotype, Walker Museum, Univ. Chicago, no. 38866.

HINDEODELLA LINEATA (Pander)

Plate 46, figures 28, 31

Lonchodus lineatus PANDER, 1856, p. 31, pl. 2A, fig. 9.

Centrodus lineatus HINDE, 1900, Nat. History Soc. Glasgow, n. ser., vol. 5, p. 341, pl. 9, figs. 13, 14.

Lonchodus? lineatus ROUNDY, 1926, U. S. Geological Survey, Prof. Paper 146, p. 15, pl. 3, figs. 6-8.

Bar long, thick but narrow, straight to slightly bowed; denticles inserted, alternating in size; cusp large, inclined; anterior termination short and almost straight. Figure 31 shows the posterior end.

Hypotypes, Walker Museum, Univ. Chicago, nos. 38867, 38868.

Genus *ICRIODUS* Branson and Mehl, 1934

ICRIODUS DERUS Cooper, n. sp.
Plate 47, figure 40

Bar widest on aboral edge, which is distinctly grooved, groove widest beneath largest denticle, which is directed forward; remaining denticles (all in one row) similar in shape, long, tapering, and round.

Holotype, Walker Museum, Univ. Chicago, no. 38869.

ICRIODUS? TYLUS Cooper, n. sp.
Plate 47, figures 60, 61, 73, 74

Tooth ovate in outline, width greatly expanded; aboral edge concave, with furrow running lengthwise; highest portion of oral surface covered with nodes.

Holotype, Walker Museum, Univ. Chicago, no. 38870; paratype, no. 38871.

Genus *LIGONODINA* Ulrich and Bassler, 1926

LIGONODINA? APORA Cooper, n. sp.
Plate 45, figure 48

Similar to *Ligonodina* in all respects save the projection, which, if ever present, was broken off while the animal was living; bar short and thin; denticles relatively large; cusp slightly curved.

Holotype, Walker Museum, Univ. Chicago, no. 38872.

LIGONODINA ARCUATA (Branson and Mehl)

Plate 45, figures 3, 4

Subbryantodus arcuatus BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 286, pl. 23, figs. 10, 11.

Tooth strongly arched, bar and denticles much heavier in back of cusp; escutcheon

wide and shallow. Differs from *Subbryantodus* in the discrete denticles, strongly arched bar, and in the character of the bar itself.

Hypotype, Walker Museum, Univ. Chicago, no. 38873.

LIGONODINA BREVIPOSTICA Branson and Mehl

Plate 47, figures 27, 36

Ligonodina brevipostica BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 289, pl. 23, fig. 32.

Tooth strongly arched; bar wide and flat, with widely spaced, rounded denticles; cusp large, with groove on inner edge.

Hypotypes, Walker Museum, Univ. Chicago, nos. 38874, 38875.

LIGONODINA CONIDENS Huddle
Plate 45, figure 45

Ligonodina angulata BRANSON AND MEHL, 1938, Missouri Univ. Studies, vol. 13, no. 4, pt. 2, p. 142, pl. 34, fig. 43.

Ligonodina conidens HUDDLE, 1934, Bull. Am. Paleontology, vol. 21, p. 249, pl. 12, figs. 18, 19.

Projection prominently developed with large denticles and off-set slightly from the plane of the cusp; cusp strongly curved and oval in cross-section; bar thin.

Hypotype, Walker Museum, Univ. Chicago, no. 38876.

LIGONODINA CYRA Cooper, n. sp.
Plate 45, figure 59

Tooth small, cusp curved, and the projection carries long, slender denticles; escutcheon deep.

Holotype, Walker Museum, Univ. Chicago, no. 38881.

LIGONODINA DELICATULA Branson and Mehl

Plate 45, figures 50, 60, 61

Ligonodina delicatula BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, pp. 199, 328, pl. 14, figs. 22, 23; pl. 27, fig. 3.

Cusp strongly curved and oval in section; bar thin; projection short and delicate.

Hypotypes, Walker Museum, Univ. Chicago, nos. 38877-38879.

LIGONODINA FLEXUOSA Branson and Mehl

Plate 45, figure 46

Ligonodina flexuosa BRANSON AND MEHL, 1934,

Missouri Univ. Studies, vol. 8, p. 199, pl. 15, figs. 26, 28.

Projection a regular continuation of the cusp and carries large denticles; cusp strongly curved; bar very thin.

Hypotype, Walker Museum, Univ. Chicago, no. 38880.

LIGONODINA LEPTA Cooper, n. sp.

Plate 45, figure 49

Cusp very small and delicate; projection heavy, with large denticles; bar thin, with small denticles.

Holotype, Walker Museum, Univ. Chicago, no. 38882.

LIGONODINA OLIGA Cooper, n. sp.

Plate 45, figure 58

Cusp very short, sharp on lateral edges; projection large, with short, pointed denticles.

Holotype, Walker Museum, Univ. Chicago, no. 38883.

LIGONODINA PLATYS Cooper, n. sp.

Plate 45, figure 47

Cusp unusually large, strongly curved, and oval in cross-section; projection small; bar thin and short.

Holotype, Walker Museum, Univ. Chicago, no. 38884.

LIGONODINA RECURVATA Branson and Mehl

Plate 45, figures 56, 57

Ligonodina recurvata BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 200, pl. 14, fig. 24.

Bar very thin; cusp long and curved; projection carries large, round denticles.

Hypotypes, Walker Museum, Univ. Chicago, nos. 38885, 38886.

LIGONODINA STYRAX Cooper, n. sp.

Plate 45, figure 51

Cusp tapering or spike-shaped, inner side straight; bar thin but carries heavy denticles inclined posteriorly; projection carries large denticles.

Holotype, Walker Museum, Univ. Chicago, no. 38887.

LIGONODINA TRANSITIONIS

(Branson and Mehl)

Plate 47, figure 55

Hindeodella transitionis BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 282, pl. 22, fig. 35.

The projection and part of the cusp of a form very closely resembling this species, which is shown to be a *Ligonodina* by the denticulation of the bar and the shape and dentition of the projection.

Hypotype, Walker Museum, Univ. Chicago, no. 38888.

Genus LONCHODINA Ulrich and

Bassler, 1926

LONCHODINA ANGULATA Cooper

Plate 47, figure 54

Lonchodina angulata COOPER, 1931, Jour. Paleontology, vol. 5, p. 235, pl. 28, fig. 13.

?*Lonchodina spinosa* E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 330, pl. 28, fig. 10

Bar wide at the base with long, widely separated denticles; cusp not much larger than denticles.

Hypotype, Walker Museum, Univ. Chicago, no. 38889.

LONCHODINA CURVIDENS E. R. Branson

Plate 47, figures 67, 68

Lonchodina curvidens E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 330, pl. 28, fig. 14.—BRANSON AND MEHL, 1938, idem., vol. 13, no. 4, pt. 2, p. 141, pl. 34, fig. 29.

Bar arched; denticles thin and round; escutcheon deep.

Hypotype, Walker Museum, Univ. Chicago, no. 38890.

LONCHODINA DISCRETA Ulrich and

Bassler

Plate 47, figures 50, 51, 71, 72

Lonchodina discreta ULRICH AND BASSLER, 1926, U. S. Nat. Mus., Proc. vol. 68, art. 12, p. 36, pl. 10, figs. 1, 2.—HOLMES, 1928, U. S. Nat. Mus., Proc., vol. 72, art. 5, p. 26, pl. 9, fig. 13.—COOPER, 1935, Jour. Paleontology, vol. 9, p. 310, pl. 27, fig. 21.

?*Lonchodina spinosa* E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 330, pl. 28, fig. 10.

Bar arched with closely spaced, long, slender denticles; cusp long and curved laterally; escutcheon narrow.

Hypotypes, Walker Museum, Univ. Chicago, nos. 38891, 38892.

LONCHODINA DISTANS Huddle

Plate 46, figure 69

Lonchodina distans HUDDLE, 1934, Bull. Am. Paleontology, vol. 21, p. 270, pl. 6, fig. 13; pl. 10, fig. 3.

Tooth strongly arched with widely spaced, flat denticles on each side of a flat, sharp-pointed cusp, which is slightly incurved.

Hypotype, Walker Museum, Univ. Chicago, no. 38893.

LONCHODINA MICROCYRA Cooper, n. sp.

Plate 47, figures 41, 47, 56, 57

Bar slightly arched, thick near center or beneath cusp, the position of the widest portion of the large, slit-like escutcheon on the aboral side; denticles closely spaced and pointed.

Holotype, Walker Museum, Univ. Chicago, no. 38895; paratype, no. 38894.

LONCHODINA PULCHRA Branson and

Mehl

Plate 47, figures 58, 59

Lonchodina pulchra BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 211, pl. 15, fig. 16.

Plate arched (right angle), denticles long, slender and round; cusp similar to denticles, inclined.

Hypotype, Walker Museum, Univ. Chicago, no. 38896.

LONCHODINA SEPARATA Branson and Mehl

Plate 47, figures 69, 70

Lonchodina separata BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 291, pl. 15, figs. 14, 15; pl. 23, fig. 22.

Bar thin, aboral edge deeply grooved; denticles long, slender, and round; cusp curved.

Hypotype, Walker Museum, Univ. Chicago, no. 38897.

Genus LONCHODUS Pander, 1856

LONCHODUS CONVEXUS (Pander)?

Plate 46, figure 35

Centrodon convexus PANDER, 1856, p. 31, pl. 2A, fig. 4.

Polygnathus convexus HINDE, Nat. History Soc. Glasgow, Trans., n. ser. vol. 5, p. 342, pl. 9, figs. 6-8.

Bar distinctly bowed and thin in propor-

tion to the size of the denticles, which are round and very large at the base.

Hypotype, Walker Museum, Univ. Chicago, no. 38898.

LONCHODUS ISCHNUS Cooper, n. sp.

Plate 46, figure 39

Bar very thin and narrow; flat and grooved on the under side; denticles long, very slender, and slightly tapering.

Holotype, Walker Museum, Univ. Chicago, no. 38899.

LONCHODUS PARALLELUS Cooper, n. sp.

Plate 46, figure 42

Bar thin but wide, distinctly grooved on aboral side; denticles inclined, closely spaced, little tapered and parallel.

Holotype, Walker Museum, Univ. Chicago, no. 38900.

LONCHODUS SIMPLEX (Pander)

Plate 46, figures 34, 38

Centrodon simplex PANDER, 1856, p. 31, pl. 2A, figs. 2, 3.

Lonchodus simplex ROUNDY, U. S. Geol. Survey, Prof. Paper 146, p. 15, pl. 3, figs. 1-5.

Bar very shallow, flat and grooved on aboral side; denticles round, massive at base, tapering to a sharp point.

Hypotypes, Walker Museum, Univ. Chicago, nos. 38901, 38902.

Genus MACROPOLYGNATHUS

Cooper, n. gen.

Plate elongate or lanceolate, narrow, straight or slightly curved laterally, seldom bowed, posterior end sharply to bluntly pointed. Carina divides plate into subequal parts, usually very prominent, crest sharp and usually without nodes. Blade is a regular continuation of the carina, sometimes very short, depending upon the length of the plate. Escutcheon small but deep, located approximately midway between the anterior end of the bar and the posterior end of the plate, and which interrupts an aboral keel, which extends the entire length of the tooth.

Genotype, *Macropolygnathus itha* Cooper, n. sp.

MACROPOLYGNATHUS ITHA

Cooper, n. sp.

Plate 42, figures 4-6

Plate elongate and about twice as long as bar; carina straight, separating plate into subequal parts; denticles completely fused; aboral ridge prominent only on the anterior end, escutcheon small, oval, and almost centrally located between anterior and posterior ends of the tooth.

Holotype, Walker Museum, Univ. Chicago, no. 38903.

MACROPOLYGNATHUS ALLOCOTA

Cooper, n. sp.

Plate 42, figures 53, 54

Plate bowed right and left, lobes unequal, ridged along margins; with a distinct shoulder on right side of anterior end in contrast to opposite side; carina uneven; bar wide, denticles fused.

Holotype, Walker Museum, Univ. Chicago, no. 38904.

MACROPOLYGNATHUS ANAMEDA

Cooper, n. sp.

Plate 42, figures 28-30

Plate irregular in outline, slightly longer than bar, margins of oral surface slightly crenulate; bar thin; carina straight; denticles distinguishable, but completely fused except for those on anterior end. This form is intermediate between *Polygnathus* and *Macropolygnathus*.

Holotype, Walker Museum, Univ. Chicago, no. 38905.

MACROPOLYGNATHUS ANODOSA

Cooper, n. sp.

Plate 42, figures 17-19

Plate irregular in outline, divided into unequal portions by a straight carina; right side abruptly produced near center of tooth, the oral side of the wide portion carrying a prominent ridge at right angles to carina; the carina highest on the anterior end, no denticles developed; escutcheon central.

Holotype, Walker Museum, Univ. Chicago, no. 38906.

MACROPOLYGNATHUS ANOMALA

Cooper, n. sp.

Plate 42, figures 1-3

Plate forms almost the entire length of

the tooth; carina straight, highest in median portion, dividing the plate into two very unequal parts; no differentiation of denticles; aboral ridge prominent for entire length; escutcheon central.

Holotype, Walker Museum, Univ. Chicago, no. 38907.

MACROPOLYGNATHUS BELA Cooper, n. sp.

Plate 42, figures 20-22

Plate slender, pointed, slightly curved, margins, crenulate; carina sharp, denticles absent; aboral ridge prominent; escutcheon central, large and deep.

Holotype, Walker Museum, Univ. Chicago, no. 38908.

MACROPOLYGNATHUS DIAMESA

Cooper, n. sp.

Plate 42, figures 69, 70; plate 43, figures 1, 2

A form intermediate between *Macropolygnathus* and *Polygnathus*, but referred to the former because of the extension of the plate along the bar; dentition similar to the latter genus.

Holotype, Walker Museum, Univ. Chicago, no. 38909; paratype, no. 38910.

MACROPOLYGNATHUS IDIA

Cooper, n. sp.

Plate 42, figures 67, 68

Plate wider than average, bowed, curved, with two unusual, abrupt extensions from the left side; denticles distinguishable but completely fused on short bar and carina.

Holotype, Walker Museum, Univ. Chicago, no. 38911.

MACROPOLYGNATHUS ISA Cooper, n. sp.

Plate 42, figures 36-38

Plate thin, flat, almost equally divided by carina, surface delicately marked by transverse ridges; carina low on posterior end, rising toward blade, where denticles become gradually differentiated. Very close to *Polygnathus*, but differs in the extension of the platform to the anterior end.

Holotype, Walker Museum, Univ. Chicago, no. 38912.

MACROPOLYGNATHUS CAMPSA

Cooper, n. sp.

Plate 42, figures 14-16

Plate occupies entire length of tooth, which is very irregular in outline; right margin furrowed, left carrying a large pit on a much-widened portion of the margin one-third the distance from the posterior end; carina sharply bent, bending also reflected in the aboral ridge, which is prominent; escutcheon large, deep, and nearer the posterior end.

Holotype, Walker Museum, Univ. Chicago, no. 38913.

MACROPOLYGNATHUS CURTA

Cooper, n. sp.

Plate 43, figures 5-7

Entire tooth strongly curved, plate unornamented and wavy in outline; carina sharp

and irregularly crested; bar short, denticles distinct; aboral ridge and escutcheon prominent.

Holotype, Walker Museum, Univ. Chicago, no. 38914.

MACROPOLYGNATHUS LEYRA

Cooper, n. sp.

Plate 42, figures 39-41

Plate irregular in outline, surface wavy but smooth, with an occasional node or transverse ridge; carina straight, sharp, plain, rising to a high, sharp point near the anterior end of the blade; denticles faintly distinguishable on blade only.

Holotype, Walker Museum, Univ. Chicago, no. 38915.

MACROPOLYGNATHUS LITA Cooper, n. sp.

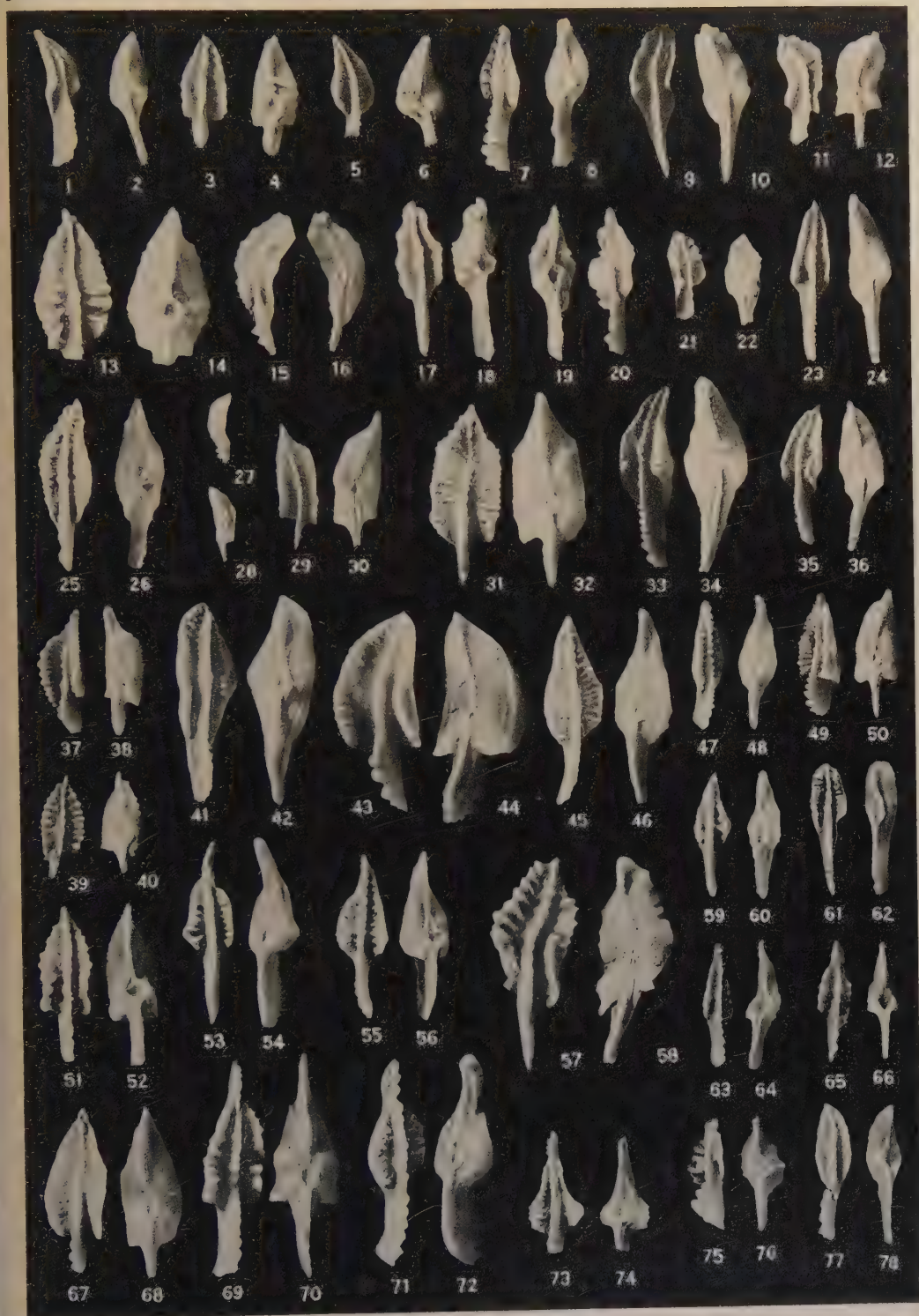
Plate 43, figures 8, 9

Plate thick at edges, with a "rolled" or

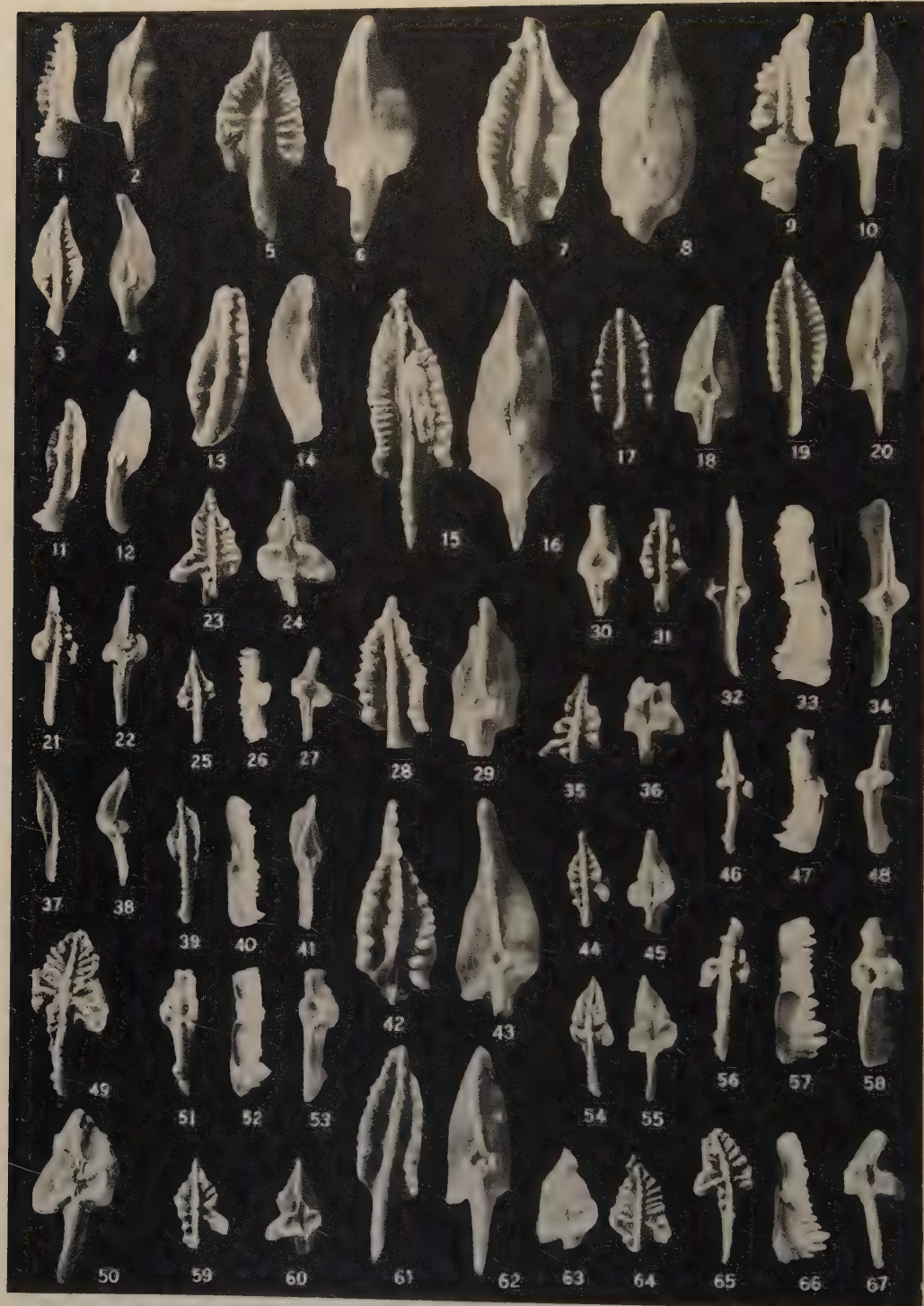
EXPLANATION OF PLATE 39

The paired figures show oral and aboral surfaces. All figures magnified $\times 18$. Specimens are from the pre-Weldon shale, lower Mississippian, south-central Oklahoma. (UC—University of Chicago). Figs. 1, 2, 9, 10, 23, 24—*Polygnathus communis* Branson and Mehl, hypotypes (UC 38972-38974).

- 3, 4—*Polygnathus oritha* Cooper, n. sp., holotype (UC 38998). (p. 399)
 5, 6—*Polygnathus radina* Cooper, n. sp., holotype (UC 39004). (p. 401)
 7, 8—*Polygnathus suroodus* Cooper, n. sp., holotype (UC 39019). (p. 403)
 11, 12—*Polygnathus inornata* Branson and Mehl, hypotypes (UC 38982). (p. 404)
 13, 14—*Polygnathus flabellum* Branson and Mehl, holotype (UC 38991). (p. 400)
 15, 16—*Polygnathus crucifera* E. R. Branson, hypotype (UC 38976). (p. 400)
 17-20—*Polygnathus cymachila* Cooper, n. sp.; 17, 18, holotype (UC 38977); 19, 20, paratype (UC 38978). (p. 399)
 21, 22—*Polygnathus lita* Cooper, n. sp., holotype (UC 38990). (p. 401)
 25, 26—*Polygnathus lacinata* Huddle, hypotype (UC 38988). (p. 401)
 27, 28—*Polygnathus semicostata* Branson and Mehl, hypotype (UC 39011). (p. 403)
 29, 30—*Polygnathus lobata* Branson and Mehl, hypotypes (UC 38983). (p. 401)
 31, 32, 43, 44—*Polygnathus longipostica* Branson and Mehl, hypotypes (UC 38991-38993). (p. 401)
 33-36—*Polygnathus adola* Cooper, n. sp.; 33, 34, holotype (UC 38966); 35, 36, paratype (UC 38967). (p. 399)
 37, 38, 49, 50—*Polygnathus curta* Cooper, n. sp.; 37, 38, paratype (UC 38986); 49, 50, holotype (UC 38987). (p. 400)
 39, 40—*Polygnathus anida* Cooper, n. sp., holotype (UC 38969). (p. 399)
 41, 42—*Polygnathus dystacta* Cooper, n. sp., holotype (UC 38980). (p. 400)
 45-48—*Polygnathus scobiniiformis* E. R. Branson, hypotypes, (UC 39008-39010). (p. 403)
 51, 52, 65, 66, 75, 76—*Polygnathus subserrata* Branson and Mehl, hypotypes (UC 39013-39015). (p. 404)
 53, 54—*Polygnathus oxyis* Cooper, n. sp., holotype (UC 39000). (p. 402)
 55, 56—*Polygnathus iitha* Cooper, n. sp., holotype (UC 38985). (p. 401)
 57, 58—*Polygnathus irregularis* Cooper, n. sp., holotype (UC 38984). (p. 400)
 59, 60—*Pseudopolygnathus stina* Cooper, n. sp., holotype (UC 39064). (p. 408)
 61, 62—*Pseudopolygnathus cyclotelum* Cooper, n. sp., holotype (UC 39054). (p. 407)
 63, 64—*Pseudopolygnathus fusiformis* Branson and Mehl, hypotype (UC 39057). (p. 408)
 67, 68—*Polygnathus spicata* E. R. Branson, hypotype (UC 39012). (p. 404)
 69, 70—*Polygnathus toxophora* Cooper, n. sp., hypotype (UC 39021). (p. 404)
 71, 72—*Polygnathus omala* Cooper, n. sp., holotype (UC 38997). (p. 401)
 73, 74—*Polygnathus xyncha* Cooper, n. sp., holotype (UC 39022). (p. 404)
 77, 78—*Polygnathus perplana* E. R. Branson, hypotype (UC 39003). (p. 402)



Cooper, Mississippian Conodonts



Cooper, Mississippian Conodonts

infolded appearance; carina straight; bar short; denticles indistinct.

Holotype, Walker Museum, Univ. Chicago, no. 38916.

MACROPOLYGNATHUS NODUS Cooper, n. sp.
Plate 42, figures 57, 58

Plate elongate, gradually tapering to a carina on anterior end, tapering gradually on opposite end; bar very short; carina and bar without denticles and straight, except near posterior end.

Holotype, Walker Museum, Univ. Chicago, no. 38917.

MACROPOLYGNATHUS OLCA Cooper, n. sp.
Plate 42, figures 31-33

Plate thick, posterior end sharply bent, folded toward carina, resulting in deep furrows on either side; carina smooth, undenticulated; bar short, with six well-developed denticles of varying length; escutcheon subcentral.

Holotype, Walker Museum, Univ. Chicago, no. 38918.

MACROPOLYGNATHUS PLATYS

Cooper, n. sp.
Plate 42, figures 25-27

Plate wider than in most species, occupies almost entire length of tooth, divided into unequal parts by a straight, sharp carina; denticles undeveloped; aboral ridge prominent; escutcheon small.

Holotype, Walker Museum, Univ. Chicago, no. 38919.

MACROPOLYGNATHUS RADINA

Cooper, n. sp.
Plate 42, figures 7-9

Plate slender, slightly curved and bowed, much longer than bar; surface marked by prominent transverse ridges; carina divides plate into almost equal parts; denticles completely fused and only slightly discernible.

EXPLANATION OF PLATE 40

Oral and aboral views except as noted. Magnification $\times 18$. All specimens are from the pre-Weldens shale, lower Mississippian, south-central Oklahoma. (UC—University of Chicago.)

Figs. 1, 2, 9, 10, 42, 43—*Polygnathus subserrata* Branson and Mehl, hypotypes (UC 39016-39018).

3, 4—*Polygnathus lacinata* Huddle, hypotype (UC 38998). (p. 404)

5, 6—*Polygnathus anomala* Cooper, n. sp., holotype (UC 38971). (p. 401)

7, 8, 15, 16—*Polygnathus macra* Cooper, n. sp., 7, 8, paratype (UC 38994); holotype (UC 38995). (p. 397)

11, 12—*Polygnathus ousnodus* Cooper, n. sp., holotype (UC 38999). (p. 401)

13, 14—*Polygnathus angusta* Branson and Mehl, hypotype (UC 38968). (p. 402)

17-20, 28, 29—*Polygnathus scapha* Huddle, hypotypes (UC 39005-39007). (p. 399)

21, 22, 35, 36—*Pseudopolygnathus irregularis* E. R. Branson hypotypes (UC 39059, 39060). (p. 403)

23, 24, 59, 60—*Pseudopolygnathus asymmetrica* E. R. Branson hypotypes (UC 39050, 39051). (p. 408)

25-27—*Pseudopolygnathus crenulata* E. R. Branson, oral, lateral, and aboral views, hypotype (UC 39053). (p. 406)

30, 31—*Pseudopolygnathus prima* Branson and Mehl, hypotype (UC 39062). (p. 407)

32-34—*Nodognathus spicata* Cooper, n. sp., oral, lateral, and aboral views of the holotype (UC 38950). (p. 408)

37, 38—*Polygnathus delicatula* Ulrich and Bassler, hypotype (UC 38979). (p. 397)

39-41—*Polygnathus pachus* Cooper, n. sp., oral lateral, and aboral views, holotype (UC 38970). (p. 400)

44, 45—*Pseudopolygnathus varicostata* E. R. Branson, hypotype (UC 39065). (p. 402)

46-48—*Nodognathus campyla* Cooper, n. sp., oral, lateral, and aboral views, holotype (UC 38952). (p. 408)

49, 50—*Pseudopolygnathus distorta* E. R. Branson, hypotype (UC 39055). (p. 397)

51-53—*Pseudopolygnathus projecta* E. R. Branson, oral, lateral, and aboral views, hypotype (UC 39063). (p. 407)

54, 55—*Pseudopolygnathus lobata* E. R. Branson, hypotype (UC 39061). (p. 408)

56-58—*Nodognathus linguifera* (E. R. Branson), oral, lateral and aboral views, hypotype (UC 38953). (p. 408)

61, 62—*Polygnathus permarginata* E. R. Branson, hypotype (UC 39002). (p. 398)

63-67—*Pseudopolygnathus apotodus* Cooper, n. sp., 63, 64, paratype (UC 39048); 65-67 oral, lateral and aboral views of holotype (UC 39049). (p. 402)

Holotype, Walker Museum, Univ. Chicago, no. 38920.

MACROPOLYGNATHUS STENA

Cooper, n. sp.

Plate 42, figures 51, 52; plate 43, figures 3, 4

Plate bowed, very narrow, irregular in outline, oral surface smooth; carina undenticulated, very uneven; bar short, wide, with five or six denticles.

Holotype, Walker Museum, Univ. Chicago, no. 38921.

MACROPOLYGNATHUS TETRODUS

Cooper, n. sp.

Plate 42, figures 55, 56

Plate long, narrow, divided unequally by a sharp-edged carina, the crest of which is somewhat irregular; bar very short and carries four distinct denticles, the middle two of which are longest.

Holotype, Walker Museum, Univ. Chicago, no. 38922.

Genus MICROCOELODUS Branson

and Mehl, 1934

MICROCOELODUS ASYMMETRICUS?

Branson and Mehl

Plate 46, figures 44, 67

Microcoelodus asymmetricus BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 91, pl. 7, figs. 5, 10, 11, 14, 15.

Tooth made up of a short, curved and fluted cusp rising from a flaring concave base with denticles on each side.

Hypotypes, Walker Museum, Univ. Chicago, nos. 38923, 38924.

MICROCOELODUS OKLAHOMENSIS

Cooper, n. sp.

Plate 46, figure 55

Cusp very short, flattened, sharp-edged, and slightly curved laterally; denticles similarly flattened and fused; escutcheon deep; base flaring.

Holotype, Walker Museum, Univ. Chicago, no. 38925.

MICROCOELODUS SCOLOPS Cooper, n. sp.

Plate 46, figures 57, 58, 65

Base wide; cusp straight on inner side, tapering regularly to a sharp point, curved

at base to form a marked inclination; denticles on flaring margin round and thick.

Holotype, Walker Museum, Univ. Chicago, no. 38926; paratypes, nos. 38927, 38928.

Genus NEOCORDYLODUS Cooper, n. gen.

Bar thin and narrow with more or less widely spaced, round denticles on oral side; aboral edge distinctly grooved longitudinally. Anterior end greatly expanded to produce an arched or flared base, which supports the relatively large, straight to curved cusp; one side of this base may be produced to form a downward projection, the upper surface of which is denticulated. The arched base forms an unusually large escutcheon or "muscle attachment."

Genotype, *Neocordylodus orthus* Cooper, n. sp.

Remarks.—This genus may be confused with *Cordylodus* Pander and *Belodus* Pander of the Prioniodidae or with several of the Distacodidae, especially if the bar has been broken off close to the cusp, which, due to its delicate character, is usually the case. However, enough of the bar usually remains that a close examination will show the aboral groove. The curvature of the cusp is posterior, and therefore toward the bar, thus showing the positions of the denticles on the projection, which are always lateral in this genus. The aboral groove and character of the denticles results in a bar similar to *Lonchodus* Pander, but since no complete specimens have been found, this comparison cannot be made with certainty. If the projection and the bar are both broken close to the cusp, the form resembles *Trichognathus* Branson and Mehl.

NEOCORDYLODUS ORTHUS

Cooper, n. sp.

Plate 46, figures 53, 59, 60, 66, 72;
plate 47, figures 4, 14

Cusp straight, sides parallel except near base and tip, lower part curved, resulting in a sharp inclination, upper part pointed; bar very thin and narrow; lateral denticles round, short and pointed.

Holotype, Walker Museum, Univ. Chicago, no. 38929; paratypes, nos. 38930–38935.

NEOCORDYLODUS ALCUS Cooper, n. sp.

Plate 46, figure 54; plate 47,
figures 6-9, 38, 39

Cusp wide at base, tapering gradually to the tip, fluted or furrowed laterally in the lower part, grading to sharp-edged above; projection denticles very short and closely spaced.

Holotype, Walker Museum, Univ. Chicago, no. 38938; paratypes, nos. 38936, 38937, 38939-38942.

NEOCORDYLODUS APALUS Cooper, n. sp.

Plate 47, figure 10

Cusp curved in lower part; projection antero-lateral; escutcheon deep.

Holotype, Walker Museum, Univ. Chicago, no. 38943.

NEOCORDYLODUS COLOBUS Cooper, n. sp.

Plate 47, figures 1, 2

Cusp short, strongly curved, with fluted sides; projection carries slender, rounded, discrete denticles. Due to the double projection and broken bar, this form might be mistaken for *Trichognathus* Branson and Mehl.

Holotype, Walker Museum, Univ. Chicago, no. 38947; paratype, no. 38946.

NEOCORDYLODUS CYCLUS Cooper, n. sp.

Plate 46, figure 52

Cusp short, regularly curved throughout its length, and sharp-edged laterally; denticle on projection long, round, and sharp-pointed.

Holotype, Walker Museum, Univ. Chicago, no. 38944.

NEOCORDYLODUS EXOCHUS Cooper, n. sp.

Plate 47, figure 3

Cusp curved, base flaring; projection prominently developed and denticulated with widely spaced, round, slender teeth.

Holotype, Walker Museum, Univ. Chicago, no. 38945.

NEOCORDYLODUS MACRODUS Cooper, n. sp.

Plate 46, figure 62; plate 47,
figure 12

Base of cusp thick and massive, with long denticle developed outward and upward; cusp slightly curved and flattened longitudinally near the tip.

Holotype, Walker Museum, Univ. Chicago, no. 38948; paratype, no. 38949.

Genus NODOGNATHUS Cooper, n. gen.

Tooth consists of a long, thin bar or blade, slightly curved or straight, finely denticulated with denticles fused almost their entire length. Plate absent, but bar thickened centrally or subcentrally by the development of a large deep escutcheon on the aboral side, the oral side of which may be developed into a long, sharp node or short ridge, separate and distinct from the carina. Longest denticles near anterior end of the bar.

Genotype, *Nodognathus spicata* Cooper, n. sp.

Remarks.—This form is intermediate between *Polygnathus*, *Pseudopolygnathus*, and *Spathodus*, as it does not possess the plate characteristics of the first two genera nor the lateral ridges along the blade, characteristic of many species of the last named genus. The development of the oral side of the escutcheon, however, distinguishes *Nodognathus* from *Spathodus*.

NODOGNATHUS SPICATA Cooper, n. sp.

Plate 40, figures 32-34

Bar almost straight, finely denticulated, longest denticles near anterior end. Escutcheon large, oval, almost bilaterally symmetrical, oral side has long, slender, sharp-pointed node on left side of carina, and a ridge-like node normal to the carina on the opposite side.

Holotype, Walker Museum, Univ. Chicago, no. 38950.

NODOGNATHUS CARIIS Cooper, n. sp.

Plate 41, figures 33-35

Bar straight; denticles distinct, very short near anterior end; escutcheon large, deep and oval, with nodes on each side of carina. A second node appears on the right side.

Holotype, Walker Museum, Univ. Chicago, no. 38951.

NODOGNATHUS CAMPYLA Cooper, n. sp.

Plate 40, figures 46-48

Aboral outline bent or curved, bar narrow, teeth wide and of irregular length;

escutcheon large, shallow, with long, sharp nodes on oral side.

Holotype, Walker Museum, Univ. Chicago, no. 38952.

NODOGNATHUS LINGUIFERA

(E. R. Branson)

Plate 40, figures 56-58

Spathodus linguiferus E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 306, pl. 27, fig. 24.

Bar short, with relatively large denticles which are more free than usual; escutcheon large, oval, deep, and carrying large irregular nodes on oral side.

Hypotype, Walker Museum, Univ. Chicago, no. 38953.

NODOGNATHUS OMPHANODA

Cooper, n. sp.

Plate 41, figures 11, 12

Similar to *N. campylus*, but nodes on oral side of the escutcheon differ in their shape and arrangement; denticles on median and posterior end of the bar are more free and more sharply pointed.

Holotype, Walker Museum, Univ. Chicago, no. 38954.

Genus *OLIGODUS* Cooper, n. gen.

Tooth short and wide, with a straight outer (?) edge, surmounted by a row of short, sharp denticles, the longest in the center. Base of aboral edge greatly expanded and deeply indented with the entire surface forming a muscle attachment or escutcheon. Numerous denticles or sharp nodes on inner oral surface and posterior end.

Genotype, *Oligodus curtus* Cooper, n. sp.

Remarks.—The lateral or straight side view has the appearance of *Pinacodus* Branson and Mehl, but this genus lacks the laterobasal development of *Oligodus*.

OLIGODUS CURTUS Cooper, n. sp.

Plate 47, figures 48, 49

Bar arched, very wide at the base; denticles short and sharp-pointed; oral and posterior edge studded with short, sharp nodes.

Holotype, Walker Museum, Univ. Chicago, no. 38955.

Genus *OZARKODINA* Branson and Mehl, 1934

OZARKODINA ABNORMIS (Branson and Mehl)

Plate 43, figures 43, 44

Spathodus abnormis BRANSON AND MEHL, 1938, Missouri Univ. Studies, vol. 13, no. 4, pt. 2, p. 138, pl. 34, fig. 11.

Bar thin, slightly arched, with long denticles fused almost to tips; cusp much wider and somewhat longer than denticles; aboral edge sharp, but grooved on each side of the escutcheon.

Hypotype, Walker Museum, Univ. Chicago, no. 38957.

OZARKODINA DERA Cooper, n. sp.

Plate 43, figure 14

Bar short and narrow; denticles very long and fused except for tips ("germ variety" of Branson and Mehl); escutcheon very small, showing little development.

Holotype, Walker Museum, Univ. Chicago, no. 38956.

Genus *PALMATODELLA* Ulrich and Bassler, 1926

PALMATODELLA PARIDENS Huddle

Plate 47, figure 44

Palmatodella paridens HUDDLE, 1934, Bull. Am. Paleontology, vol. 21, p. 243, pl. 11, fig. 3.

Bar straight, with closely spaced, long thin denticles; cusp inclined forward; projection less than 90 degrees with bar, and similarly denticulated; escutcheon wide.

Hypotype, Walker Museum, Univ. Chicago, no. 38958.

Genus *PINACODUS* Branson and Mehl, 1934

PINACODUS ANOMIUS Cooper, n. sp.

Plate 45, figures 36, 41

Tooth unequally divided by a well-developed cusp, which is located directly over a wide, deep escutcheon; denticles partially to entirely fused.

Holotype, Walker Museum, Univ. Chicago, no. 38960; paratype, no. 38959.

PINACODUS BRACHYS Cooper, n. sp.

Plate 45, figure 43

Plate small; cusp very wide but unusually short, with denticles on opposite sides very unequal in size; escutcheon of average width.

Holotype, Walker Museum, Univ. Chicago, no. 38961.

PINACODUS PROFUNDUS Branson
and Mehl

Plate 45, figures 29, 35

Pinacodus profundus BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 269, pl. 22, figs. 1-4.

Tooth short, wide, slightly arched; denticles completely or nearly fused; cusp subcentral; escutcheon flaring.

Hypotypes, Walker Museum, Univ. Chicago, nos. 38962, 38963.

PINACODUS SUBBREVIS (Ulrich and
Bassler)

Plate 45, figure 24

Bryantodus subbrevis ULRICH AND BASSLER, 1926, U. S. Nat. Mus., Proc., vol. 68, art. 12, p. 28, pl. 10, figs. 15, 16.

Tooth small, flat; denticles few in number, grading in size from cusp to either end; escutcheon narrow but deep.

Hypotype, Walker Museum, Univ. Chicago, no. 38964.

PINACODUS SYNCHUS Cooper, n. sp.
Plate 45, figure 40

Tooth short; denticles long, wide, and completely fused but distinct; escutcheon very prominent.

Holotype, Walker Museum, Univ. Chicago, no. 38965.

Genus POLYGNATHUS Hinde, 1876

POLYGNATHUS ADOLA Cooper, n. sp.
Plate 39, figures 33-36

Plate smooth, margins noncrenulated and thick, tapering anteriorly; bar shorter than plate, carrying numerous small, coalescing denticles. This species differs from *P. communis* Branson and Mehl in the thick development of plate margins.

Holotype, Walker Museum, Univ. Chicago, no. 38966; paratype, no. 38967.

POLYGNATHUS ANGUSTA Branson
and Mehl

Plate 40, figures 13, 14

Polygnathus angusta BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 245, pl. 20, figs. 8, 14; pl. 21, fig. 14.

Plate long, narrow, thick, margin slightly crenulate; carina straight, with top serrate

due to free tips of denticles; escutcheon large and wide.

Hypotype, Walker Museum, Univ. Chicago, no. 38968.

POLYGNATHUS ANIDA Cooper, n. sp.
Plate 39, figures 39, 40

Plate bowed longitudinally, margin bridged transversely, border crenulate, unequally divided by carina; escutcheon slit-like, widest posteriorly, bar narrow, finely denticulated.

Holotype, Walker Museum, Univ. Chicago, no. 38969.

POLYGNATHUS ANOMALA
Cooper, n. sp.

Plate 40, figures 5, 6

Plate thick, bowed and curved, irregular in outline, asymmetrical, posterior end pointed, margins strongly furrowed; bar short and wide; denticles completely fused; carina nodular and interrupted near center of plate; escutcheon small, ovate and subcentral.

Holotype, Walker Museum, Univ. Chicago, no. 38971.

POLYGNATHUS COMMUNIS Branson
and Mehl

Plate 39, figures 1, 2, 9, 10, 23, 24

Polygnathus communis BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 293, pl. 24, figs. 1-4.—E. R. BRANSON, 1934, idem., p. 308, pl. 25, figs. 5, 6.

Plate smooth on aboral side; escutcheon small and slit-like, oral side smooth and slightly incurved; blade well developed, finely denticulate and longer than plate.

Hypotypes, Walker Museum, Univ. Chicago, nos. 38972-38974.

POLYGNATHUS CRUCIFERA
E. R. Branson

Plate 39, figures 15, 16

Polygnathus crucifera E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 311, pl. 25, fig. 12.

Plate longer than wide, curved and arched, platform marked by low transverse ridges; escutcheon of medium size and elongate-longitudinal; bar short, less than one-half the length of the plate, carrying few wide denticles; denticles on carina poorly developed.

Hypotype, Walker Museum, Univ. Chicago, no. 38976.

POLYGNATHUS CURTA Cooper, n. sp.

Plate 39, figures 37, 38, 49, 50

Plate similar to *P. inornatus* Branson and Mehl in outline, but more strongly curved transversely, so that the cross section is almost V-shaped; bar very short, thin, with closely fused denticles in a cockscomb arrangement.

Holotype, Walker Museum, Univ. Chicago, no. 38987; paratype, no. 38986.

POLYGNATHUS CYMACHILA

Cooper, n. sp.

Plate 39, figures 17-20

Plate smooth, with very irregularly crenulated margin; carina straight and smooth; escutcheon of medium size and deep; bar short, plain to indistinctly denticulate; denticles separated at tips if at all.

Holotype, Walker Museum, Univ. Chicago, no. 38977; paratype, no. 38978.

POLYGNATHUS DELICATULA Ulrich
and Bassler

Plate 40, figures 37, 38

Polygnathus delicatulus ULRICH AND BASSLER, 1926, U. S. Nat. Mus., Proc., vol. 68, art. 12, p. 45, pl. 7, figs. 9, 10.—COOPER, 1935, Jour. Paleontology, vol. 9, p. 314, pl. 27, fig. 37.

Plate thin and bowed, outline regular, pointed, punctate, subequally divided by the carina; blade thin and finely denticulate; escutcheon oval and shallow.

Hypotype, Walker Museum, Univ. Chicago, no. 38979.

POLYGNATHUS DYSTACTA

Cooper, n. sp.

Plate 39, figures 41, 42

Plate large, thick, irregular in outline, with one margin extended in its median portion to give an infolded appearance, margin ornamented with short, fine, transverse ridges; bar short; denticles fused except for tips; carina smooth.

Holotype, Walker Museum, Univ. Chicago, no. 38980.

POLYGNATHUS EXODUS Cooper, n. sp.

Plate 42, figures 42, 44

Plate long, slender, straight (except at posterior end), tapering, folded to produce a

deep furrow on each side of the carina, surface at margins marked with faint transverse ridges; blade wide, bowed toward oral surface; denticles completely fused except for final two, which project abruptly above the others, the final one being much the longest; escutcheon central.

Holotype, Walker Museum, Univ. Chicago, no. 38981.

POLYGNATHUS FLABELLUM Branson
and Mehl

Plate 39, figures 13, 14

Polygnathus flabella BRANSON AND MEHL, 1938, Missouri Univ. Studies, vol. 13, no. 4, pt. 2, p. 147, pl. 34, fig. 48.

Plate almost symmetrical, wide, flat transversely but bowed longitudinally, surface ridged; carina very slightly curved.

Hypotype, Walker Museum, Univ. Chicago, no. 38991.

POLYGNATHUS INORNATA
E. R. Branson

Plate 39, figures 11, 12

Polygnathus inornata E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 309, pl. 25, figs. 8, 26.—BRANSON AND MEHL, 1934, idem., vol. 8, p. 293, pl. 24, figs. 5-7.—BRANSON AND MEHL, 1938, idem., vol. 13, no. 4, pt. 2, p. 146, pl. 34, fig. 37.

Plate curved and arched, platform ridged transversely and separated into unequal portions by a thin carina, poorly denticulate; bar shorter than plate, with small denticles which coalesce, except near their terminations; escutcheon small and elongate.

Hypotypes, Walker Museum, Univ. Chicago, nos. 38982, 38983.

POLYGNATHUS IRREGULARIS
Cooper, n. sp.

Plate 39, figures 57, 58

Plate large and irregular in outline, strongly curved transversely and longitudinally, outline serrate, surface strongly marked by ridges; a deep furrow parallels the carina on the right side due to the strong fold of the plate; blade short, wide and thin, with wide, fused denticles; escutcheon small and slit-like.

Holotype, Walker Museum, Univ. Chicago, no. 38984.

POLYGNATHUS ITHA Cooper, n. sp.

Plate 39, figures 55, 56

Plate sharply pointed, straight on right side, curved on left, bowed, and only slightly curved longitudinally; surface marked by transverse ridges and furrows; blade thin, wide, with numerous narrow, fused denticles which become longer as carina crosses the plate toward the posterior end; carina straight except for a slight curvature beginning near the center of the bar.

Holotype, Walker Museum, Univ. Chicago, no. 38985.

POLYGNATHUS LACINATA Huddle

Plate 39, figures 25, 26; plate 40, figures 3, 4

Polygnathus lacinata HUDDLE, 1934, Bull. Am. Paleontology, vol. 21, p. 281, pl. 8, figs. 1-3.

Plate narrow, tapering; oral surface marked by deep transverse ridges and furrows; bar short, with wide coalescing denticles, which are completely fused on the carina.

Hypotypes, Walker Museum, Univ. Chicago, nos. 38988, 38989.

POLYGNATHUS LITA Cooper, n. sp.

Plate 39, figures 21, 22

Plate small, curved longitudinally, posterior margin incurved, border slightly crenulate, denticles poorly developed.

Holotype, Walker Museum, Univ. Chicago, no. 38990.

POLYGNATHUS LOBATA Branson and Mehl

Plate 39, figures 29, 30

Polygnathus lobata BRANSON AND MEHL, 1938, Missouri Univ. Studies, vol. 13, no. 4, pt. 2, p. 146, pl. 34, figs. 44-47.

Plate curved and bowed; surface marked by ridges; sides unequal in size and shape; escutcheon small and subcentral; blade wide and thin.

Hypotype, Walker Museum, Univ. Chicago, no. 38983.

POLYGNATHUS LONGIPOSTICA Branson and Mehl

Plate 39, figures 31, 32, 43, 44

Polygnathus longipostica BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 294, pl. 24, figs. 8-11, 13.—E. R. BRANSON, 1934, *idem.*, p. 311, pl. 25, fig. 18.

Plate semiovate, slightly curved and bowed, carina plain, dividing plate into subequal parts, margins furrowed; bar short with small number of denticles in a cockscomb arrangement; escutcheon small, deep and circular.

Hypotypes, Walker Museum, Univ. Chicago, nos. 38991-38993.

POLYGNATHUS MACRA Cooper, n. sp.

Plate 40, figures 7, 8, 15, 16

Plate large, elongate, pointed, slightly irregular in outline, strongly bowed and slightly curved, margins ridged transversely; carina smooth to nodular, straight or very slightly curved; bar wide, short, with wide, fused denticles; escutcheon small, slit-like, subcentral.

Holotype, Walker Museum, Univ. Chicago, no. 38995; paratype, no. 38994.

POLYGNATHUS MARGINATA

Branson and Mehl

Plate 41, figures 15, 16

Polygnathus marginata BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 294, pl. 23, figs. 25-27.

Plate wide, bowed, subequally divided by a prominent nodular carina, nodes becoming longer anteriorly; bar wide, thin, carrying numerous fused denticles with rounded ends.

Hypotype, Walker Museum, Univ. Chicago, no. 38996.

POLYGNATHUS OMALA Cooper, n. sp.

Plate 39, figures 71, 72

Plate ovate, flat, thick and furrowed by transverse ridges, slender and pointed on posterior end; blade thin, wide, narrowing toward plate; denticles wide and fused except tips; carina slightly curved, denticulate, denticles longer and more free on posterior end.

Holotype, Walker Museum, Univ. Chicago, no. 38997.

POLYGNATHUS ORTHA Cooper, n. sp.

Plate 39, figures 3, 4

Plate ovate, tapering to a point posteriorly, oral edges crenulate; escutcheon large; denticles on bar lacking or poorly developed, becoming slightly pointed on plate.

Holotype, Walker Museum, Univ. Chicago, no. 38998.

POLYGNATHUS OUSNODUS Cooper, n. sp.
Plate 40, figures 11, 12

Plate subovate, slightly curved, subsymmetrical, surface unevenly marked with ridges, nodes and pits; carina straight, uneven; bar short; denticles totally fused and indistinct, next to final denticle long, pointed; escutcheon large, oval, subcentral and raised from the surface of the plate.

Holotype, Walker Museum, Univ. Chicago, no. 38999.

POLYGNATHUS OXYS Cooper, n. sp.
Plate 39, figure 53, 54

Plate bowed and curved, very narrow and pointed posteriorly, widening toward the anterior end, terminating against the blade with an abrupt shoulder, margin thick and marked by prominent transverse ridges and furrows; blade short and wide, carrying a small number of wide, fused denticles, the third and fourth from the end being the longest; carina slightly curved.

Holotype, Walker Museum, Univ. Chicago, no. 39000.

POLYGNATHUS PACHUS Cooper, n. sp.
Plate 40, figures 39-41

Plate short and narrow, thick, outline regular, right edge subparallel to carina,

left side semioval; bar longer than plate, thin and finely denticulated; escutcheon large, deep and asymmetrical.

Holotype, Walker Museum, Univ. Chicago, no. 38970.

POLYGNATHUS PERMARGINATA

E. R. Branson

Plate 40, figures 61, 62

Polygnathus permarginata E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 312, pl. 26, fig. 19.

Plate long and slightly bowed, curved transversely, giving a deep furrow on each side of carina, margin faintly marked by transverse ridges; carina straight; blade short and wide; escutcheon small, oval, deep and subcentral.

Hypotype, Walker Museum, Univ. Chicago, no. 39002.

POLYGNATHUS PERPLANA

E. R. Branson

Plate 39, figures 77, 78

Polygnathus perplana E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 309, pl. 25, fig. 7.

Plate subovate, symmetrical, slightly curved longitudinally, only very faintly marked along the margins; carina smooth and slightly curved near posterior end; bar

EXPLANATION OF PLATE 41

Oral and aboral views except as noted. Magnification $\times 18$. All specimens are from the pre-Weldens shale, lower Mississippian, south-central Oklahoma. (UC—University of Chicago.)

- FIGS. 1, 2—*Siphonognathus crenulata* Cooper, n. sp., holotype (UC 39068). (p. 409)
3, 4, 7, 8, 38, 39—*Siphonognathus sexplicata* Branson and Mehl, hypotypes (UC 39076, 39077). (p. 410)
5, 6, 19, 20—*Siphonognathus isolopha* Cooper, n. sp.; 5, 6, holotype (UC 39069); 19, 20, paratype (UC 39070). (p. 409)
9, 10—*Siphonognathus isosticha* Cooper, n. sp., holotype (UC 38975). (p. 409)
11, 12—*Nodognathus omphanoda* Cooper, n. sp., holotype (UC 38954). (p. 398)
13, 14—*Pseudopolygnathus asymmetrica* E. R. Branson, hypotype (UC 39052). (p. 406)
15, 16—*Polygnathus marginata* Branson and Mehl, hypotype (UC 38996). (p. 401)
17, 18—*Spathodus delicatulus* E. R. Branson, hypotype (UC 39818). (p. 413)
21, 22—*Siphonognathus newalbanyensis* (Huddle), hypotype (UC 39073). (p. 409)
23-25, 30-32—*Gnathodus mosquensis* Pander, oral, lateral, and aboral views, hypotypes (UC 38848, 38849). (p. 388)
26, 27—*Gnathodus texanus* (Roundy), hypotype (UC 38853). (p. 388)
28, 29—*Siphonognathus perlobata* Cooper, n. sp., holotype (UC 39074). (p. 409)
33-35—*Nodognathus caris* Cooper, n. sp., oral, lateral, and aboral views, holotype (UC 38951). (p. 397)
36, 37, 46, 47—*Siphonognathus lobata* Branson and Mehl, hypotypes (UC 39071, 39072). (p. 409)
40, 41—*Gnathodus stinus* Cooper, n. sp., holotype (UC 38852). (p. 388)
42, 43—*Dryphenotus punctatus* Cooper, n. sp., paratype (UC 38817). (p. 387)
44, 45—*Siphonognathus quadruplicata* Branson and Mehl, hypotype (UC 39075). (p. 409)
48, 49—*Dryphenotus macrolobus* Cooper, n. sp., paratype (UC 38821). (p. 387)
50, 51—*Polygnathus symmetrica* Cooper, n. sp., holotype (UC 39020). (p. 404)



Cooper, Mississippian Conodonts



wide, thin, carrying wide, fused denticles; escutcheon large and subcentral.

Hypotype, Walker Museum, Univ. Chicago, no. 39003.

POLYGNATHUS RADINA Cooper, n. sp.

Plate 39, figures 5, 6

Plate small and curved longitudinally, tapering rapidly posteriorly; escutcheon large and wider than long; bar thin, narrow, carrying very small denticles.

Holotype, Walker Museum, Univ. Chicago, no. 39004.

POLYGNATHUS SCAPHA Huddle

Plate 40, figures 17–20, 28, 29

Polygnathus scapha HUDDLE, 1934, Bull. Am. Paleontology, vol. 21, p. 288, pl. 8, figs. 33–35.

Plate elongate, margins crenulate, carina slightly nodular and bordered by furrow; bar short and wide with few denticles; escutcheon small, deep and subcentral.

Hypotypes, Walker Museum, Univ. Chicago, nos. 39005–39007.

POLYGNATHUS SCOBINIFORMIS

E. R. Branson

Plate 39, figures 45–48

Polygnathus scobiniformis E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 314, pl. 25, fig. 23.

Plate thick, flat on oral side and strongly marked by prominent ridges; anterior end tapering; carina prominent and smooth to nodular; bar short, wide, with fused denticles.

Hypotypes, Walker Museum, Univ. Chicago, nos. 39008–39010.

POLYGNATHUS SEMICOSTATUS

Branson and Mehl

Plate 39, figures 27, 28

Polygnathus semicostatus BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 247, pl. 21, figs. 1, 2.

EXPLANATION OF PLATE 42

Paired figures show oral and aboral views; groups of three figures show oral, lateral, and aboral views. Magnification $\times 18$. All specimens are from the pre-Welden shale, lower Mississippian, south-central Oklahoma. (UC—University of Chicago.)

- FIGS. 1–3—*Macropolygnathus anomala* Cooper, n. sp., holotype (UC 38907). (p. 393)
 4–6—*Macropolygnathus itha* Cooper, n. sp., oral, lateral, and aboral views of holotype (UC 38903). (p. 393)
 7–9—*Macropolygnathus radina* Cooper, n. sp., holotype (UC 38920). (p. 395)
 10, 11—*Dryphenotus punctatus* Cooper, n. sp., paratype (UC 38818). (p. 386)
 12, 13—*Dryphenotus oxyis* Cooper, n. sp., holotype (UC 38822). (p. 386)
 14–16—*Macropolygnathus campsa* Cooper, n. sp., holotype (UC 38913). (p. 394)
 17–19—*Macropolygnathus anodosa* Cooper, n. sp., holotype (UC 38906). (p. 393)
 20–22—*Macropolygnathus bela* Cooper, n. sp., holotype (UC 38908). (p. 393)
 23, 24—*Pseudopolygnathus exotyla* Cooper, n. sp., holotype (UC 39056). (p. 408)
 25–27—*Macropolygnathus platys* Cooper, n. sp., holotype (UC 38919). (p. 395)
 28–30—*Macropolygnathus anameda* Cooper, n. sp., holotype (UC 38905). (p. 393)
 31–33—*Macropolygnathus olca* Cooper, n. sp., holotype (UC 38918). (p. 395)
 34, 35—*Dryphenotus litus* Cooper, n. sp., holotype (UC 38819). (p. 386)
 36–38—*Macropolygnathus isa* Cooper, n. sp., holotype (UC 38912). (p. 393)
 39–41—*Macropolygnathus leyra* Cooper, n. sp., holotype (UC 38915). (p. 394)
 42–44—*Polygnathus exodus* Cooper, n. sp., holotype (UC 38981). (p. 400)
 45, 46—*Dryphenotus macrolobus* Cooper, n. sp., holotype (UC 38820). (p. 386)
 47–50—*Gnathodus perplexus* Branson and Mehl, 47, 48 hypotype (UC 38842); 49, 50 hypotype (UC 38843). (p. 388)
 51, 52—*Macropolygnathus stenna* Cooper, n. sp., holotype (UC 38921). (p. 396)
 53, 54—*Macropolygnathus allocota* Cooper, n. sp., holotype (UC 38904). (p. 393)
 55, 56—*Macropolygnathus tetrodus* Cooper, n. sp., holotype (UC 38922). (p. 396)
 57, 58—*Macropolygnathus nodus* Cooper, n. sp., holotype (UC 38917). (p. 395)
 59, 60—*Gnathodus bilineatus* Roundy, hypotype (UC 38844). (p. 388)
 61, 62—*Gnathodus isomeces* Cooper, n. sp., holotype (UC 38845). (p. 388)
 63, 64—*Spathodus texanus* Roundy, hypotype (UC 39819). (p. 416)
 65, 66—*Gnathodus loncotus* Cooper, n. sp., holotype (UC 38847). (p. 388)
 67, 68—*Macropolygnathus idia* Cooper, n. sp., holotype (UC 38911). (p. 393)
 69, 70—*Macropolygnathus diamesa* Cooper, n. sp., holotype (UC 38909). (p. 393)
 71, 72—*Gnathodus lius* Cooper, n. sp., holotype (UC 38846). (p. 388)
 73, 74—*Gnathodus parallelus* Cooper, n. sp., holotype (UC 38851). (p. 388)
 75, 76—*Gnathodus mosquensis* Pander, hypotype (UC 38850). (p. 388)
 77, 78—*Gnathodus typicus* Cooper, n. sp., holotype (UC 38854). (p. 388)

Plate strongly arched, small, divided into unequal parts by carina; bar very short, with denticles well developed.

Hypotype, Walker Museum, Univ. Chicago, no. 39011.

POLYGNATHUS SPICATA E. R. Branson

Plate 39, figures 67, 68

Polygnathus spicata E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 312, pl. 25, fig. 20.

Plate almost equilateral, posterior half tapering to a sharp point, sides nearly straight and subparallel, surface marked by low transverse ridges; bar short, thin, with few wide, sharp-pointed denticles; carina low, nodular and straight.

Hypotype, Walker Museum, Univ. Chicago, no. 39012.

POLYGNATHUS SUBSERRATA

Branson and Mehl

Plate 39, figures 51, 52, 65, 66, 75, 76;

plate 40, figures 1, 2, 9, 10, 42, 43

Polygnathus subserrata BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 248, pl. 20, figs. 17-19.

Plate subtriangular in outline, strongly bowed anteriorly to form a trough on each side of the carina, margins serrated by nodes on oral surface; bar short, wide, with five wide, pointed, fused denticles; escutcheon small, deep and subcentral.

Hypotypes, Walker Museum, Univ. Chicago, nos. 39013-39018.

POLYGNATHUS SURODUS Cooper, n. sp.

Plate 39, figures 7, 8

Plate small, lanceolate, crenulate on oral margin; escutcheon large and shallow; bar about equal to plate in length, thin, increasing in width toward posterior end; denticles on bar six in number, wide, tapering longitudinally to a point.

Holotype, Walker Museum, Univ. Chicago, no. 39019.

POLYGNATHUS SYMMETRICA

Cooper, n. sp.

Plate 41, figures 50, 51

Plate elongate, pointed at both ends; carina straight; bar short, wide, with denticles fused, except at the tips.

Holotype, Walker Museum, Univ. Chicago, no. 39020.

POLYGNATHUS TOXOPHORA

Cooper, n. sp.

Plate 39, figures 69, 70

Plate large, bowed and folded, narrow and pointed posteriorly, margins crenulate and deeply furrowed; carina straight and divides plate into equal parts; blade short, wide at anterior end, narrowing toward plate; denticles fused except at tips, longest next to last on anterior end. Due to gradation of denticle size toward plate, crest of carina is greatly depressed in the center.

Holotype, Walker Museum, Univ. Chicago, no. 39021.

POLYGNATHUS XYNCHA Cooper, n. sp.

Plate 39, figures 73, 74

Plate lanceolate, merging with carina a short distance behind the posterior end, margins transversely ridged; carina denticulate, denticles more free on posterior end; bar wide, denticles subequal; escutcheon small, oval and subcentral.

Holotype, Walker Museum, Univ. Chicago, no. 39022.

Genus PRIONIODUS Pander, 1856

PRIONIODUS ALATOIDEUS Cooper

Plate 45, figure 62; plate 46, figure 19

Prioniodus alatoideus COOPER, 1931, Jour. Paleontology, vol. 5, p. 232, pl. 28, fig. 1.

Cusp inclined sharply forward; bar narrow, denticles fused.

Hypotypes, Walker Museum, Univ. Chicago, nos. 39023, 39024.

PRIONIODUS ALATUS Hinde

Plate 45, figure 55; plate 46, figures 6, 8

Prioniodus alatus HINDE, 1879, Geol. Soc. London, Quart. Jour., vol. 35, p. 361, pl. 16, fig. 5.—BRYANT, 1921, Buffalo Soc. Nat. History, Bull., vol. 13, p. 15, pl. 3, fig. 4; pl. 4, figs. 1-7.—ULRICH AND BASSLER, 1926, U. S. Nat. Mus., Proc., vol. 68, art. 12, p. 11, pl. 1, figs. 25, 26.—BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 134, pl. 11, fig. 13.

Cusp very wide and flat, sharp-edged; bar thin, denticles completely fused, projection prominent; flat and sharp-edged.

Hypotypes, Walker Museum, Univ. Chicago, nos. 39025-39027.

PRIONIODUS BARBATUS Branson
and Mehl

Plate 46; figures 17, 18

Prioniodus barbatus BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 288, pl. 23, figs. 19, 20.—BRANSON AND MEHL, 1938, idem., vol. 13, no. 4, pt. 2, p. 144, pl. 34, figs. 28, 32.

Bar thin and narrow; denticles long, narrow and fused; projection long, tapering and sharp-edged; escutcheon deep.

Hypotypes, Walker Museum, Univ. Chicago, nos. 39028, 39029.

PRIONIODUS CHONEUTUS Cooper, n. sp.

Plate 46, figures 1, 2

Bar thin; denticles long, thin, but of variable diameter and completely fused; cusp flat and inclined forward; projection short.

Holotype, Walker Museum, Univ. Chicago, no. 39030; paratype, no. 39031.

PRIONIODUS CONCAVUS Ulrich
and Bassler

Plate 46, figure 12

Prioniodus concavus ULRICH AND BASSLER, 1926, U. S. Nat. Mus., Proc., vol. 68, art. 12, p. 10, pl. 9, fig. 11.

Bar thin with denticles inclined sharply forward; cusp flat and sharp-edged; projection short; escutcheon wide and shallow.

Hypotype, Walker Museum, Univ. Chicago, no. 39032.

PRIONIODUS CULTURATUS Ulrich
and Bassler

Plate 45, figure 64

Prioniodus culturatus ULRICH AND BASSLER, 1926, U. S. Nat. Mus., Proc., vol. 68, art. 12, p. 9, pl. 9, fig. 7.—HOLMES, 1928, idem., vol. 72, art. 5, p. 24, pl. 9, fig. 4.—COOPER, 1931, Jour. Paleontology, vol. 5, p. 146, pl. 20, fig. 2; idem., vol. 9, pl. 27, fig. 4.

Cusp flat, tapered and at right angles to bar; denticles round and tapered; projection short.

Hypotype, Walker Museum, Univ. Chicago, no. 39033.

PRIONIODUS ENGLYPHUS Cooper, n. sp.

Plate 46, figure 13

Bar wide but thin; denticles completely fused; cusp narrow, inclined forward, and strongly indented on the anterior side

where it joins the bar; projection short and wide with a rounded termination.

Holotype, Walker Museum, Univ. Chicago, no. 39035.

PRIONIODUS LEYRUS Cooper, n. sp.

Plate 45, figure 54

Bar very thin; denticles large and fused at margins; cusp very wide at base, flat, sharp-edged and curved toward front; projection short; escutcheon very wide and flaring.

Holotype, Walker Museum, Univ. Chicago, no. 39036.

PRIONIODUS MAGNUS Cooper, n. sp.

Plate 47, figure 64

Bar straight; aboral edge wide; denticles discrete, large, round; cusp large and curved; escutcheon wide.

Holotype, Walker Museum, Univ. Chicago, no. 39034.

PRIONIODUS MUTABILIS Branson
and Mehl

Plate 45, figure 52

Prioniodus mutabilis BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 207, pl. 15, figs. 1, 2.

Tooth slightly curved; bar thin, with closely spaced, round denticles; cusp large, projection short, with aboral end rounded.

Hypotype, Walker Museum, Univ. Chicago, no. 39037.

PRIONIODUS OLIGUS Cooper, n. sp.

Plate 46, figures 9–11, 63, 71;

plate 47, figures 20, 21

Prioniodus sp. *B* ROUNDY, 1926, U. S. Geol. Survey, Prof. Paper 146, p. 11, pl. 4, fig. 10.

Cusp short but very wide, flat and sharp-edged fore and aft; projection short and pointed; escutcheon wide and deep, with flaring edges.

Holotype, Walker Museum, Univ. Chicago, no. 39041; paratypes, nos. 39038–39040, 39042–39044.

PRIONIODUS ORTHUS Cooper, n. sp.

Plate 45, figure 53

Bar thin; denticles fused; cusp at right angles to bar and straight on inner side; projection heavy.

Holotype, Walker Museum, Univ. Chicago, no. 39047.

PRIONIODUS PECULIARIS Branson
and Mehl

Plate 45, figure 63

Prioniodus peculiaris BRANSON AND MEHL, 1934,
Missouri Univ. Studies, vol. 8, p. 287, pl. 23,
fig. 15.

Cusp short, curved; projection large; bar
thin, with small, flat denticles; escutcheon
large and flaring.

Hypotype, Walker Museum, Univ. Chi-
cago, no. 39045.

PRIONIODUS PERACUTUS Hinde

Plate 46, figure 7

Prioniodus peracutus HINDE, 1900, Nat. History
Soc. Glasgow, Trans., n. ser., vol. 5, p. 343,
pl. 10, figs. 21-23.—ROUNDY, 1926, U. S.
Geol. Survey, Prof. Paper 146, p. 10, pl. 4,
figs. 6-8.

Cusp long, flat and sharp-edged; projec-
tion short; bar thin, denticles fused except
in upper part; escutcheon very narrow and
elongated.

Hypotype, Walker Museum, Univ. Chi-
cago, no. 39046.

Genus PSEUDOPOLYGNATHUS Branson
and Mehl, 1934

PSEUDOPOLYGNATHUS APETODUS

Cooper, n. sp.

Plate 40, figures 63-67

Plate pointed, wide anteriorly, prominent
ridges on oral surface giving a serrate out-
line; carina curved and nodular; bar thin,
wide, about equal the length of the bar;
denticles free for approximately half their
length, longest on anterior end; escutcheon
very wide, shallow and subcentral.

Holotype, Walker Museum, Univ. Chi-
cago, no. 39049; paratype, no. 39048.

PSEUDOPOLYGNATHUS ASYMMETRICA

E. R. Branson

Plate 40, figures 23, 24, 59, 60;
plate 41, figures 13, 14

EXPLANATION OF PLATE 43

Paired figures show endo- and exopleural views, except as noted. Magnification $\times 18$. All speci-
mens are from the pre-Welden shale, lower Mississippian, south-central Oklahoma. (UC—University
of Chicago.)

- FIGS. 1, 2—*Macropolygnathus diamesa* Cooper, n. sp., oral and aboral views, paratype (UC 38910).
(p. 393)
3, 4—*Macropolygnathus stenna* Cooper, n. sp., oral and aboral views, holotype (UC 38921).
(p. 396)
5-7—*Macropolygnathus curta* Cooper, n. sp., oral, lateral, and aboral views, holotype (UC
38914). (p. 394)
8, 9—*Macropolygnathus lita* Cooper, n. sp., oral and aboral views, holotype (UC 38916).
(p. 394)
10, 11—*Subbryantodus brevidens* (Huddle), hypotype (UC 39840). (p. 417)
12—*Subbryantodus orthus* Cooper, n. sp., holotype (UC 39842). (p. 417)
13—*Subbryantodus radinus* Cooper, n. sp., holotype (UC 39844). (p. 417)
14—*Ozarkodina dera* Cooper, n. sp., holotype (UC 38956). (p. 398)
15—*Subbryantodus ethys* Cooper, n. sp., holotype (UC 39841). (p. 417)
16, 17—*Bryantodus curtus* Cooper, n. sp., holotype (UC 38805). (p. 385)
18, 19—*Bryantodus colobus* Cooper, n. sp., holotype (UC 38804). (p. 385)
20, 21, 31, 32—*Bryantodus macer* Branson and Mehl, hypotypes (UC 38806, 38807). (p. 385)
22, 23—*Subbryantodus aulus* Cooper, n. sp., holotype (UC 39839) (p. 416)
24—*Bryantodus scolops* Cooper, n. sp., holotype (UC 38811). (p. 385)
25, 26—*Bryantodus mundus* Branson and Mehl, hypotype (UC 38808). (p. 385)
27, 28—*Bryantodus flexus* Branson and Mehl, hypotype (UC 38803). (p. 385)
29, 30—*Bryantodus planus* Branson and Mehl, hypotype (UC 38810). (p. 385)
33, 34—*Bryantodus orthus* Cooper, n. sp., holotype (UC 38809). (p. 385)
35, 36—*Subbryantodus? scitulus* (Branson and Mehl), hypotype (UC 39845). (p. 417)
37, 38—*Subbryantodus? stenus* Cooper, n. sp., holotype (UC 39846). (p. 417)
39, 40—*Subbryantodus aratus* Cooper, n. sp., holotype (UC 39835). (p. 416)
41, 42—*Subbryantodus camaratus* Cooper, n. sp., holotype (UC 39836). (p. 417)
43, 44—*Ozarkodina abnormis* (Branson and Mehl), hypotype (UC 38957). (p. 398)
45, 46—*Bryantodus tylus* Cooper, n. sp., holotype (UC 38812). (p. 386)
47-52, 58-60—*Solenognathus plecta* Cooper, n. sp., endopleural, aboral and exopleural views;
47-49 holotype (UC 39100); 50-52, 58-60, paratypes (UC 39801, 39802). (p. 412)
53, 54—*Pseudopolygnathus fusiformis* Branson and Mehl, oral and aboral views, hypotype
(UC 39058). (p. 408)
55-57—*Solenognathus carinata* (Cooper), endopleural, aboral, and exopleural views, hypotype
(UC 39086). (p. 410)



Cooper, Mississippian Conodonts



Cooper, Mississippian Conodonts

Pseudopolygnathus asymmetrica E. R. BRANSON,
Missouri Univ. Studies, vol. 8, p. 320, pl. 26,
fig. 12.

Plate short, thick, asymmetrical in outline, marked by prominent ridges; escutcheon very large, shallow and bilaterally asymmetrical.

Hypotypes, Walker Museum, Univ. Chicago, nos. 39050-39052.

PSEUDOPOLYGNATHUS CRENULATA

E. R. Branson

Plate 40, figures 25-27

Pseudopolygnathus crenulata E. R. BRANSON,
1934, Missouri Univ. Studies, vol. 8, p. 321,
pl. 26, figs. 4, 5, 7, 8.

Plate small, narrow, asymmetrical in outline, carina slightly curved; bar wide; denticles fused almost entire length; escutcheon almost as large as plate.

Hypotype, Walker Museum, Univ. Chicago, no. 39053.

PSEUDOPOLYGNATHUS CYCLOTELUM

Cooper, n. sp.

Plate 39, figures 61, 62

Plate short, narrow and rounded on posterior end, surface marked with faint transverse ridges and furrows; blade wide, thin, carrying denticles entirely fused except near the end, where two extend above the general level of the carina; carina straight, dividing plate into subequal parts.

Holotype, Walker Museum, Univ. Chicago, no. 39054.

PSEUDOPOLYGNATHUS DISTORTA

E. R. Branson

Plate 40, figures 49, 50

Pseudopolygnathus distorta E. R. BRANSON, 1934,
Missouri Univ. Studies, vol. 8, p. 318, pl. 26,
figs. 16, 17.

Plate wide, thick, irregular in outline, flat on oral surface, which is marked by transverse ridges; blade short, wide, thin, with wide-pointed denticles; carina straight

EXPLANATION OF PLATE 44

Endopleural, aboral, and exopleural views, except as noted. Magnification $\times 18$. All specimens are from the pre-Weldon shale, lower Mississippian, south-central Oklahoma. (UC—University of Chicago.)

- FIGS. 1-3—*Solenognathus pecta* Cooper, n. sp., holotype (UC 39099). (p. 412)
4-6—*Solenognathus isomeces* Cooper, n. sp., holotype (UC 39092). (p. 411)
7-9—*Solenognathus eura* Cooper, n. sp., holotype (UC 39089). (p. 411)
10-12—*Solenognathus amphelicta* Cooper, n. sp., holotype (UC 39079). (p. 410)
13, 14—*Solenognathus macra* Cooper, n. sp., endo- and exopleural views, holotype (UC 39095). (p. 411)
15-17—*Solenognathus anomala* Cooper, n. sp., holotype (UC 39082). (p. 410)
18-20, 44, 45, 49-51—*Solenognathus typica* Cooper, n. sp., 18-20, holotype (UC 39088); 44, 45, 49-51, paratypes (UC 39809, 39810). (p. 412)
21-23, 52-54—*Solenognathus oliga* Cooper, n. sp., 21-23, holotype (UC 39097); 52-54, paratype (UC 39098). (p. 412)
24-26, 42, 43—*Solenognathus tyla* Cooper, n. sp., 24-26, holotype (UC 39807); 42, 43, paratype (UC 39010). (p. 412)
27-29—*Solenognathus anomalodus* Cooper, n. sp., holotype (UC 39081). (p. 410)
30—*Solenognathus lacerata* Branson and Mehl, exopleural view, hypotype (UC 39094). (p. 411)
31, 32—*Solenognathus arala* Cooper, n. sp., endo- and exopleural views, holotype (UC 39083). (p. 410)
33-35—*Solenognathus costata* E. R. Branson, hypotype (UC 39882). (p. 410)
36, 37—*Solenognathus tenera* E. R. Branson, endo- and exopleural views, hypotype (UC 39805). (p. 412)
38, 39—*Solenognathus syntyla* Cooper, n. sp., endo- and exopleural views, holotype (UC 39083). (p. 412)
40, 41—*Solenognathus micra* Cooper, n. sp., holotype (UC 39096). (p. 412)
46-48—*Solenognathus anida* Cooper, n. sp., holotype (UC 39080). (p. 410)
55-57—*Solenognathus eurynota* Cooper, n. sp., holotype (UC 39090). (p. 411)
58-60—*Solenognathus camura* (Huddle), hypotype (UC 39085). (p. 410)
61-63—*Solenognathus fulcra* Branson and Mehl, hypotype (UC 39091). (p. 411)
64-66—*Solenognathus tabulata* Branson and Mehl, hypotype (UC 39804). (p. 412)
67-69—*Solenognathus trinodus* Cooper, n. sp., holotype (UC 39806). (p. 412)
70-72—*Solenognathus dicta* Cooper, n. sp., holotype (UC 39087). (p. 411)

but not prominent; escutcheon very large, irregular in outline and asymmetrical.

Hypotype, Walker Museum, Univ. Chicago, no. 39055.

PSEUDOPOLYGNATHUS EXOTYLA

Cooper, n. sp.

Plate 42, figures 23, 24

Plate irregular in outline and without transverse furrows on oral surface, which is characteristic of most species, but ornamented by sinuous ridges; bar without denticles; escutcheon large, deep, asymmetrical.

Holotype, Walker Museum, Univ. Chicago, no. 39056.

PSEUDOPOLYGNATHUS FUSIFORMIS

Branson and Mehl

Plate 39, figures 63, 64; plate 43, figures 53, 54

Pseudopolygnathus fusiformis BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 298, pl. 23, figs. 1-3.

Plate curved, slender, tapering, posterior end pointed, surface marked with ridges; blade wide at end, thin, with wide pointed fused denticles, longest near end of blade; carina straight; escutcheon large, oval, subcentral.

Hypotypes, Walker Museum, Univ. Chicago, nos. 39057, 39058.

PSEUDOPOLYGNATHUS IRREGULARIS

E. R. Branson

Plate 40, figures 21, 22, 35, 36

Pseudopolygnathus irregularis E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 316, pl. 26, figs. 25, 26.

Plate asymmetrical, anterior end joining bar at right angles, anterior end rapidly tapering and coalescing with carina short of posterior end, surface very uneven, studded with prominent nodes; blade longer than plate, narrow, longest denticles second and third from end, fused except at tips; escutcheon large, oval and asymmetrical.

Hypotypes, Walker Museum, Univ. Chicago, nos. 39059, 39060.

PSEUDOPOLYGNATHUS LOBATA

E. R. Branson

Plate 40, figures 54, 55

Pseudopolygnathus lobata E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 322, pl. 26, figs. 1, 2.

Plate short, narrow, slightly bowed, oral surface flat and marked by fairly distinct ridges; bar wide, short, thin; denticles wide near end of bar, narrowing toward plate; escutcheon very large and shallow.

Hypotype, Walker Museum, Univ. Chicago, no. 39061.

PSEUDOPOLYGNATHUS PRIMA?

Branson and Mehl

Plate 40, figures 30, 31

Pseudopolygnathus prima BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 298, pl. 24, figs. 24, 25.

Plate very small, thick, covered with few large nodes; escutcheon large and shallow, almost circular. Questionably assigned to *P. prima* because of fragmentary character.

Hypotype, Walker Museum, Univ. Chicago, no. 39062.

PSEUDOPOLYGNATHUS PROJECTA

E. R. Branson

Plate 40, figures 51-53

Pseudopolygnathus projecta E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 320, pl. 26, figs. 10, 11.

Plate very thick, narrow and shorter than the bar; carina prominent and straight; bar wide and thick; denticles on bar and carina completely fused; escutcheon small, suggesting a relationship to *Polygnathus*.

Hypotype, Walker Museum, Univ. Chicago, no. 39063.

PSEUDOPOLYGNATHUS STINA

Cooper, n. sp.

Plate 39, figures 59, 60

Plate narrow, pointed right side marked by prominent ridges, while opposite side is nearly smooth; blade narrow, thin and about as long as plate; denticles fused, wide at end of bar, narrowing toward plate; carina straight; escutcheon large, oval.

Holotype, Walker Museum, Univ. Chicago, no. 39064.

PSEUDOPOLYGNATHUS VARICOSTATA

E. R. Branson

Plate 40, figures 44, 45

Pseudopolygnathus varicostata E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 318, pl. 26, figs. 19, 20.

Plate narrow, thick, pointed; carina distinct, nodular; blade thin, wide and topped

by small denticles; escutcheon subcentral, very wide and shallow.

Hypotype, Walker Museum, Univ. Chicago, no. 39065.

Genus *PTEROCONUS* Branson
and Mehl, 1934

PTEROCONUS? *BICYRUS* Cooper, n. sp.
Plate 46, figure 68

Cusp doubly curved; base widely flaring and deep-set, round denticle near lateral edge.

Holotype, Walker Museum, Univ. Chicago, no. 39066.

PTEROCONUS? *NEOSSUS* Cooper, n. sp.
Plate 46, figure 61

Base flaring, with two denticles on one side and a smaller one on the opposite side of the cusp, cusp bent near base, inner side straight, slightly tapered.

Holotype, Walker Museum, Univ. Chicago, no. 39067.

Genus *SIPHONOGNATHUS* Branson
and Mehl, 1934

SIPHONOGNATHUS *CRENULATA*
Cooper, n. sp.
Plate 41, figures 1, 2

Plate short, unequally divided by a low carina, small nodes on narrow side, faint transverse ridges on the broad side, posterior end pointed; aboral side smooth except for the crenulated margin; escutcheon very faint.

Holotype, Walker Museum, Univ. Chicago, no. 39068.

SIPHONOGNATHUS *ISOLOPHA*
Cooper, n. sp.
Plate 41, figures 5, 6, 19, 20

Plate wide, asymmetrical, lower right margin extended, one ridge parallels each side of the carina at anterior end, making a deep furrow; oral surface nodular and furrowed.

Holotype, Walker Museum, Univ. Chicago, no. 39069, paratype, no. 39070.

SIPHONOGNATHUS *ISOSTICHA*
Cooper, n. sp.
Plate 41, figures 9, 10

A form intermediate between a true *Polygnathus* Hinde and *Siphonognathus*

Branson and Mehl, being more closely allied to the latter.

Holotype, Walker Museum, Univ. Chicago, no. 38975.

SIPHONOGNATHUS *LOBATA*
Branson and Mehl

Plate 41, figures 36, 37, 46, 47

Siphonognathus lobata BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 297, pl. 24, figs. 14, 15.

Plate curved and slightly bowed; distinctly lobate, oral side marked with numerous transverse ridges; carina prominent.

Hypotypes, Walker Museum, Univ. Chicago, nos. 39071, 39072.

SIPHONOGNATHUS *NEWALBANYENSIS*
(Huddle)

Plate 41, figures 21, 22

Polygnathus newalbanyensis HUDDLE, 1934, Bull. Am. Paleontology, vol. 21, p. 287, pl. 8, figs. 26-28.

Plate strongly bowed, oral surface prominently marked by nodes and ridges; bar complete, short, thin, and wide; denticles long and wide near end of bar, shorter and narrower near plate.

Hypotype, Walker Museum, Univ. Chicago, no. 39073.

SIPHONOGNATHUS *PERLOBATA*
Cooper, n. sp.

Plate 41, figures 28, 29

Similar to *S. lobatus* Branson and Mehl, except that the furrows bordering the carina are more incised and the lobe on the right side is produced into a point; escutcheon very small.

Holotype, Walker Museum, Univ. Chicago, no. 39074.

SIPHONOGNATHUS *QUADRUPLICATA*
Branson and Mehl

Plate 41, figures 44, 45

Siphonognathus quadruplicata BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 295, pl. 24, figs. 18-21.

Plate strongly bowed, carina almost straight, nodular and paralleled by a prominent ridge on anterior end; oral surface faintly marked with nodes and ridges.

Hypotype, Walker Museum, Univ. Chicago, no. 39075.

SIPHONOGNATHUS SEXPLICATA

Branson and Mehl

Plate 41, figures 3, 4, 7, 8, 38, 39

Siphonognathus sexplicata BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 296, pl. 24, figs. 22, 23.

Plate short and wide; carina paralleled by two or more ridges on each side of carina at anterior end; oral surface marked by prominent ridges and nodes.

Hypotypes, Walker Museum, Univ. Chicago, nos. 39076-39078.

Genus SOLENOGNATHUS Branson and Mehl, 1934

SOLENOGNATHUS AMPHELICTA

Cooper, n. sp.

Plate 44, figures 10-12

Blade large, flat on anterior end, opposite end infolded almost at right angles; denticles fused except at tips; cusp very wide; lateral ridge poorly formed on outside, inner ridge prominent in median portion; escutcheon well developed.

Holotype, Walker Museum, Univ. Chicago, no. 39079.

SOLENOGNATHUS ANIDA

Cooper, n. sp.

Plate 44, figures 46-48

Blade only slightly twisted, gently bowed; denticles very irregular in size, those on posterior end larger than cusp; immediately over escutcheon occurs two large denticles of equal size, thereby differing from most species of this genus.

Holotype, Walker Museum, Univ. Chicago, no. 39080.

SOLENOGNATHUS ANOMALODUS

Cooper, n. sp.

Plate 44, figures 27-29

Blade curved, slightly twisted and surmounted by denticles of irregular size and shape, one near the posterior end being almost as large as the cusp; lateral ridges prominent; escutcheon deep and wide.

Holotype, Walker Museum, Univ. Chicago, no. 39081.

SOLENOGNATHUS ANOMALA

Cooper, n. sp.

Plate 44, figures 15-17

Blade thin and flat, except posterior end

which is exceedingly short and distinctly incurved, placing the cusp well back; denticles long, slender and fused; escutcheon deep and wide, causing a bulging on the outside of the aboral margin.

Holotype, Walker Museum, Univ. Chicago, no. 39082.

SOLENOGNATHUS ARAIA

Cooper, n. sp.

Plate 44, figures 31, 32

Blade small, almost flat, nearly straight, lateral ridge much more developed in inner side; escutcheon very small.

Holotype, Walker Museum, Univ. Chicago, no. 39083.

SOLENOGNATHUS BIDENTATA

Cooper, n. sp.

Plate 45, figures 9, 10

Blade flat, slightly bowed, lateral ridges unequal, with a row of nodes developed to denticle proportions on the oral surface of the larger one; denticles fused, subequal.

Holotype, Walker Museum, Univ. Chicago, no. 39084.

SOLENOGNATHUS CAMURA (Huddle)

Plate 44, figures 58-60

Bryantodus camurus HUDDLE, 1934, Bull. Am. Paleontology, vol. 21, p. 254, pl. 2, figs. 6-9.

Blade wide, bowed, aboral edge wide due to position of lateral ridges, which are prominent (fig. 59); denticles long, narrow, and fused.

Hypotype, Walker Museum, Univ. Chicago, no. 39085.

SOLENOGNATHUS CARINATA

(Cooper)

Plate 43, figures 55-57

Polygnathellus carinatus COOPER, 1935, Jour. Paleontology, vol. 9, p. 315, pl. 27, fig. 17.

Blade flat, with prominent lateral ridges; cusp pointed, very wide at the base; posterior denticles large, but smaller than cusp; escutcheon deep.

Hypotype, Walker Museum, Univ. Chicago, no. 39086.

SOLENOGNATHUS COSTATA

E. R. Branson

Plate 44, figures 33-35

Solenognathus costata E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 332, pl. 27, fig. 7.

Blade wide, posterior end bowed and incurved; denticles discrete in upper part; cusp fairly prominent, lateral ridges moderately developed; escutcheon narrow and deep.

Hypotype, Walker Museum, Univ. Chicago, no. 39882.

SOLENOGNATHUS CURTA

Cooper, n. sp.

Plate 45, figures 5, 6

Tooth curved and bowed, lateral ridges unequally developed, inner (and larger) one nodular on oral surface; cusp but little longer than largest denticles; escutcheon small.

Holotype, Walker Museum, Univ. Chicago, no. 39093.

SOLENOGNATHUS DICHA

Cooper, n. sp.

Plate 44, figures 70-72

Blade short; denticles long and wide; two denticles of equal size (but not much larger than others) occupy position above escutcheon; lateral ridges very wide in center of tooth, narrowing toward each end.

Holotype, Walker Museum, Univ. Chicago, no. 39087.

SOLENOGNATHUS DICROCHEILA

E. R. Branson

Plate 45, figures 7, 8

Solenognathus dicrocheila E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 333, pl. 27, fig. 9.

Tooth large, strongly bowed, lateral ridges unequal, inner one carrying prominent nodes on oral surface; denticles completely fused, no prominent cusp; escutcheon very small.

Hypotype, Walker Museum, Univ. Chicago, no. 39088.

SOLENOGNATHUS EURA

Cooper, n. sp.

Plate 44, figures 7-9

Blade almost flat, slightly arched and surmounted with almost completely fused denticles, those on anterior end only slightly larger than the others; cusp very wide at base, upper third tapering to a point; escutcheon very wide causing unequal flaring of that part of the aboral surface; lateral ridges only moderately developed.

Holotype, Walker Museum, Univ. Chicago, no. 39089.

SOLENOGNATHUS EURYNOTA

Cooper, n. sp.

Plate 44, figures 55-57

Plate very wide due to prominent lateral ridges (fig. 56); denticles straight, short, wide, except one next to cusp, which is almost equal to cusp in size; escutcheon deep and elongate.

Holotype, Walker Museum, Univ. Chicago, no. 39090.

SOLENOGNATHUS FULCRA

Branson and Mehl

Plate 44, figures 61-63

Solenognathus fulcra BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 272, pl. 22, figs. 8-10.

Blade very strongly twisted on posterior end, inner lateral ridge prominent, with a long spikelike protuberance adjacent to the cusp.

Hypotype, Walker Museum, Univ. Chicago, no. 39091.

SOLENOGNATHUS ISOMECEs

Cooper, n. sp.

Plate 44, figures 4-6

Blade almost straight, crowned with subequal denticles; main cusp about twice as long, terminal denticles do not show usual development; inner lateral ridge short and wide, with nodes on oral surface.

Holotype, Walker Museum, Univ. Chicago, no. 39092.

SOLENOGNATHUS LACERATA

Branson and Mehl

Plate 44, figure 30

Solenognathus lacerata BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 271, pl. 22, figs. 5, 6.

Blade small, slightly curved, somewhat twisted posteriorly; denticles long and narrow (one larger than cusp); escutcheon proportionally large.

Hypotype, Walker Museum, Univ. Chicago, no. 39094.

SOLENOGNATHUS MACRA Cooper, n. sp.

Plate 44, figures 13, 14

Blade long because of unusual length of

posterior portion, which is slightly incurved; lateral ridges developed in median portions only, the outer one unusually short (fig. 13).

Holotype, Walker Museum, Univ. Chicago, no. 39095.

SOLENOGNATHUS MICRA Cooper, n. sp.

Plate 44, figures 40, 41

Blade small, sharply bent downward at the position of the cusp; anterior denticles much longer and wider than those on opposite side of cusp; escutcheon very large proportionally.

Holotype, Walker Museum, Univ. Chicago, no. 39096.

SOLENOGNATHUS OLIGA Cooper, n. sp.

Plate 44, figures 21-23, 52-54

Blade short compared to height; denticles on anterior end curved toward opposite end and crowded near middle of bar; cusp long, wide at base; outer lateral ridge ends in shoulder near center of tooth.

Holotype, Walker Museum, Univ. Chicago, no. 39097; paratype, no. 39098.

SOLENOGNATHUS PECTA Cooper, n. sp.

Plate 44, figures 1-3

Blade thin, with denticles completely fused and indistinct, except at tips, those in front of cusp longer and wider than on opposite side; cusp wide, tapering to a point; inner lateral ridge prominent, except at ends of blade.

Holotype, Walker Museum, Univ. Chicago, no. 39099.

SOLENOGNATHUS PLECTA Cooper, n. sp.

Plate 43, figures 47-52, 58-60

Blade slightly arched and flat, except posterior end, which has a twisted appearance; denticles fused except for tips, with those near anterior end well developed; escutcheon well-formed and elongate or slitlike.

Holotype, Walker Museum, Univ. Chicago, no. 39100; paratypes, nos. 39801, 39802.

SOLENOGNATHUS SYNTYLA

Cooper, n. sp.

Plate 44, figures 38, 39

Blade small, flat and surmounted with denticles of various lengths, those near anterior end being the largest; inner lateral

ridge very wide and punctate near cusp; escutcheon prominent.

Holotype, Walker Museum, Univ. Chicago, no. 39803.

SOLENOGNATHUS TABULATA

Branson and Mehl

Plate 44, figures 64-66

Solenognathus tabulata BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 271, pl. 22, fig. 7.

Blade short; lateral ridges very wide (fig. 65); denticles short and wide; cusp also very wide.

Hypotype, Walker Museum, Univ. Chicago, no. 39804.

SOLENOGNATHUS TENERA E. R. Branson

Plate 44, figures 36, 37

Solenognathus tenera E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 332, pl. 27, fig. 8.

Blade wide and flat; aboral ridge straight; anterior denticles long and narrow; cusp only slightly longer than two longest denticles, one adjacent to the cusp, the other near the posterior end; escutcheon small.

Hypotype, Walker Museum, Univ. Chicago, no. 39805.

SOLENOGNATHUS TRINODUS Cooper, n. sp.

Plate 44, figures 67-69

Blade curved and bowed; inner lateral ridge wide; three large denticles of equal size occupy the position above escutcheon.

Holotype, Walker Museum, Univ. Chicago, no. 39806.

SOLENOGNATHUS TYLA Cooper, n. sp.

Plate 44, figures 24-26, 42, 43

Blade very wide at base due to development of lateral ridges, the inner one of which is covered by nodes on the oral side; cusp prominent; escutcheon wide.

Holotype, Walker Museum, Univ. Chicago, no. 39807; paratype, no. 39010.

SOLENOGNATHUS TYPICA Cooper, n. sp.

Plate 44, figures 18-20, 44, 45, 49-51

Blade thin, arched, posterior end twisted; denticles fused, several near anterior end as large as the cusp; escutcheon deep and elongate.

Holotype, Walker Museum, Univ. Chicago, no. 39808; paratypes, nos. 39809, 39810.

Genus SPATHODUS Branson and
Mehl, 1934

SPATHODUS ABNORMIS Branson
and Mehl

Plate 45, figures 39, 42

Spathodus abnormis BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 277, pl. 22, fig. 20.—E. R. BRANSON, 1934, *idem.*, p. 308, pl. 28, fig. 22.

Tooth long; bar narrow and slightly bowed; denticles small and almost uniform in size; escutcheon broad.

Hypotypes, Walker Museum, Univ. Chicago, nos. 39811, 39812.

SPATHODUS ACIDENTATUS

E. R. Branson

Plate 45, figures 26, 28, 44

Spathodus acidentatus E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 306, pl. 27, figs. 21, 23.

Blade wide, almost straight; denticles long, subequal, largest near anterior end and near center; escutcheon large.

Hypotypes, Walker Museum, Univ. Chicago, nos. 39813–39815.

SPATHODUS CHOUTEAUENSIS

Cooper, n. sp.

Plate 45, figure 20

Spathodus elongatus BRANSON AND MEHL, 1938, Missouri Univ. Studies, vol. 13, no. 4, pt. 2, p. 139, pl. 34, fig. 9 (not fig. 6).

Figures 6 and 9 of Branson and Mehl (1938) are considered different species due to the curvature of the aboral edge of the bar, the subcentral position and size of the escutcheon, and the length of the denticles.

Holotype, Walker Museum, Univ. Chicago, no. 39883.

SPATHODUS CRASSIDENTATUS

Branson and Mehl

Plate 45, figure 19

Spathodus crassidentatus BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 276, pl. 22, figs. 17, 18.—E. R. BRANSON, 1934, *idem.*, p. 303, pl. 27, fig. 15.

Spathodus parvus HUDDLE, 1934, Bull. Am. Paleontology, vol. 21, p. 276, pl. 7, fig. 16.

Blade straight, narrow, with subequal denticles; escutcheon very wide and back of center of tooth.

Hypotype, Walker Museum, Univ. Chicago, no. 39816.

SPATHODUS CYCLUS Cooper, n. sp.

Plate 45, figure 32

Tooth straight; denticles on one side slightly curved toward largest one over escutcheon; those on opposite side smaller and straight; escutcheon narrow and deep.

Holotype, Walker Museum, Univ. Chicago, no. 39817.

SPATHODUS DELICATULUS E. R. Branson

Plate 41, figures 17, 18

Spathodus delicatulus E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 304, pl. 27, fig. 14.

Blade thin, narrow and greatly thickened on the central portion of the aboral surface, forming a wide, shallow escutcheon; denticles wide, fused for most of their length, tips rounded.

Hypotype, Walker Museum, Univ. Chicago, no. 39818.

SPATHODUS? DERODUS Cooper, n. sp.

Plate 45, figure 27

Tooth short, slightly arched; denticles long and well differentiated, largest near center; escutcheon wide and deep.

Holotype, Walker Museum, Univ. Chicago, no. 39820.

SPATHODUS EXOCHUS Cooper, n. sp.

Plate 45, figure 30

Tooth long, slightly curved; denticles subequal; escutcheon wide, with an unusual aboral projection on one side.

Holotype, Walker Museum, Univ. Chicago, no. 39821.

SPATHODUS ISUS Cooper, n. sp.

Plate 45, figure 33

Tooth straight; denticles equal in length but variable in diameter; escutcheon almost central and wide, causing a prominent flaring of the aboral edge.

Holotype, Walker Museum, Univ. Chicago, no. 39822.

SPATHODUS CYRIUS Cooper, n. sp.

Plate 45, figure 25

Tooth straight; denticles of subequal length and width; escutcheon wide and subcentral.

Holotype, Walker Museum, Univ. Chicago, no. 39823.

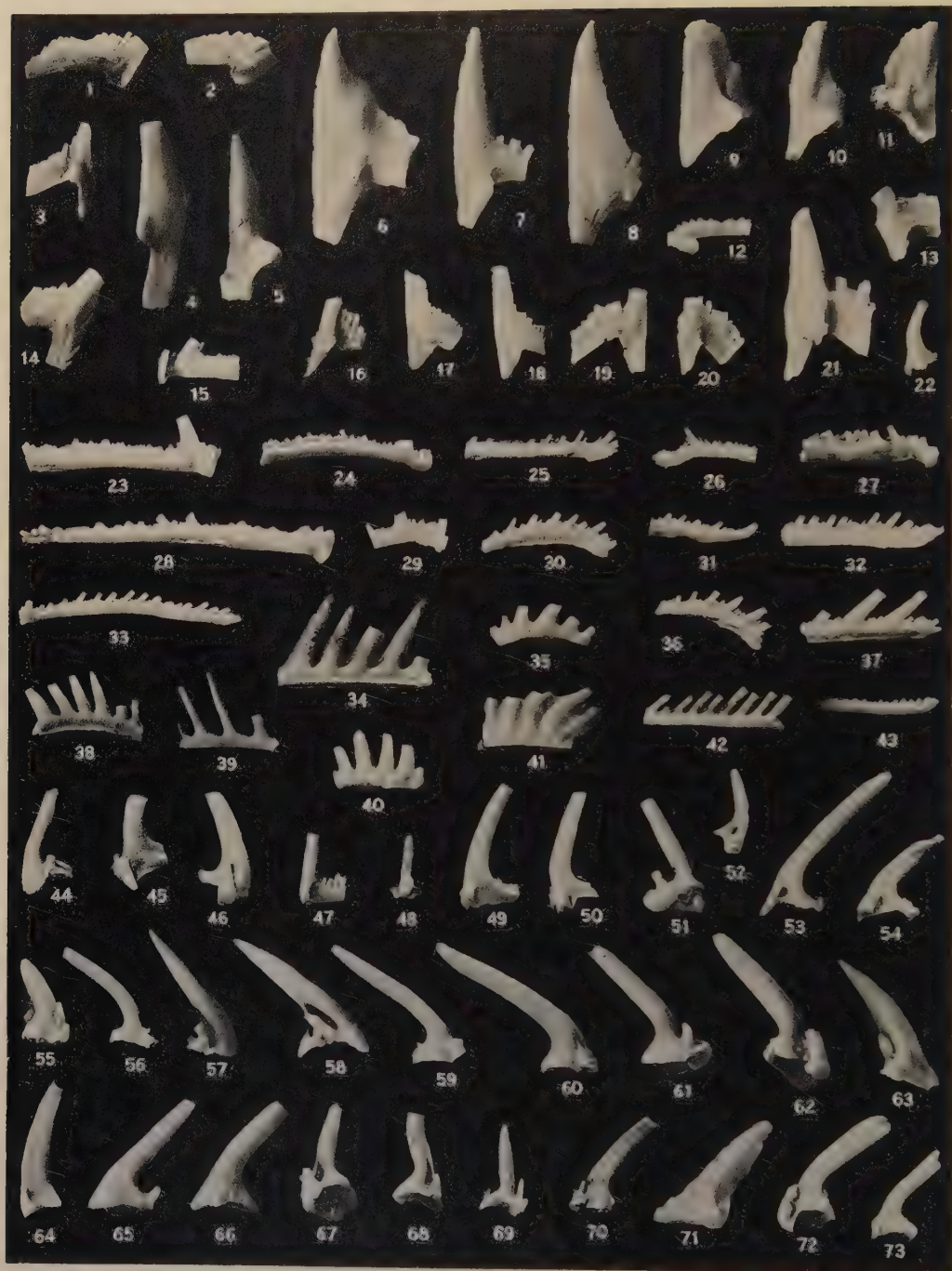
EXPLANATION OF PLATE 45

All specimens are from the pre-Weldens shale, lower Mississippian, south-central Oklahoma. Magnification $\times 18$. (UC—University of Chicago.)

- FIGS. 1, 2—*Elictoognathus bialata* (Branson and Mehl), endo- and exopleural views, hypotype (UC 38823). (p. 387)
- 3, 4—*Ligonodina arcuata* (Branson and Mehl), endo- and exopleural views, hypotype (UC 38873). (p. 390)
- 5, 6—*Solenognathus curta* Cooper, n. sp., endo- and exopleural views, holotype (UC 39093). (p. 411)
- 7, 8—*Solenognathus dicrocheila* E. R. Branson, endo- and exopleural views, hypotype (UC 39088). (p. 411)
- 9, 10—*Solenognathus bidentata* Cooper, n. sp., endo- and exopleural views, holotype (UC 39084). (p. 410)
- 11, 12, 15, 16—*Subbryantodus angulatus* (Cooper), endo- and exopleural views hypotypes (UC 39833, 39834). (p. 416)
- 13, 14, 21, 22—*Subbryantodus arcuatus* Branson and Mehl, endo- and exopleural views, hypotypes (UC 39837, 39838). (p. 416)
- 17, 18—*Spathodus sulciferus* Branson and Mehl, lateral views, hypotypes (UC 39830, 39831). (p. 416)
- 19—*Spathodus crassidentatus* Branson and Mehl, lateral view, hypotype (UC 39816). (p. 413)
- 20—*Spathodus chouteauensis* Cooper, holotype (UC 39883). (p. 413)
- 23—*Spathodus macrodus* Cooper, n. sp., lateral view, holotype (UC 39825). (p. 415)
- 24—*Pinacodus subbrevis* (Ulrich and Bassler), lateral view, hypotype (UC 38964). (p. 399)
- 25—*Spathodus cyrius* Cooper, n. sp., lateral view, holotype (UC 39823). (p. 413)
- 26, 28, 44—*Spathodus acidentatus* E. R. Branson, lateral views, hypotypes (UC 39813–39815). (p. 413)
- 27—*Spathodus? derodus* Cooper, n. sp., lateral view, holotype (UC 39820). (p. 413)
- 29, 35—*Pinacodus profundus* Branson and Mehl, lateral views, hypotypes (UC 38962, 38963). (p. 399)
- 30—*Spathodus exochus* Cooper, n. sp., lateral views, hypotype (UC 39821). (p. 413)
- 31—*Spathodus parvifossatus* Branson and Mehl, lateral view, hypotype (UC 39828). (p. 416)
- 32—*Spathodus cyclus* Cooper, n. sp., lateral view, holotype (UC 39817). (p. 413)
- 33—*Spathodus isus* Cooper, n. sp., lateral view, holotype (UC 39822). (p. 413)
- 34—*Spathodus micrus* Cooper, n. sp., lateral view, holotype (UC 39826). (p. 416)
- 36, 41—*Pinacodus anomius* Cooper, n. sp., lateral views; 36, paratype (UC 38959); 41, holotype (UC 38960). (p. 398)
- 37—*Spathodus strigilis* Huddle, lateral view, hypotype (UC 39829). (p. 416)
- 38—*Spathodus regularis* Branson and Mehl, lateral view, hypotype (UC 39824). (p. 415)
- 39, 42—*Spathodus abnormis* Branson and Mehl, lateral views, hypotypes (UC 39811, 39812). (p. 413)
- 40—*Pinacodus synchus* Cooper, n. sp., lateral view, holotype (UC 38965). (p. 399)
- 43—*Pinacodus brachys* Cooper, n. sp., lateral view, holotype (UC 38961). (p. 398)
- 45—*Ligonodina conidens* Huddle, lateral view, hypotype (UC 38876). (p. 390)
- 46—*Ligonodina flexuosa* Branson and Mehl, lateral view, hypotype (UC 38880). (p. 390)
- 47—*Ligonodina platys* Cooper, n. sp., lateral view, holotype (UC 38884). (p. 391)
- 48—*Ligonodina? apora* Cooper, n. sp., lateral view, holotype (UC 38872). (p. 390)
- 49—*Ligonodina lepta* Cooper, n. sp., lateral view, holotype (UC 38882). (p. 391)
- 50, 60, 61—*Ligonodina delicatula* Branson and Mehl, lateral views, hypotypes (UC 38877–38879). (p. 390)
- 51—*Ligonodina styrax* Cooper, n. sp., lateral view, holotype (UC 38887). (p. 391)
- 52—*Prioniodus mutabilis* Branson and Mehl, lateral view of cusp, hypotype (UC 39037). (p. 405)
- 53—*Prioniodus orthus* Cooper, n. sp., lateral view of cusp, holotype (UC 39047). (p. 405)
- 54—*Prioniodus leyrus* Cooper, n. sp., lateral view of cusp, holotype (UC 39036). (p. 405)
- 55—*Prioniodus alatus* Hinde, lateral view of cusp, hypotype (UC 39025). (p. 404)
- 56, 57—*Ligonodina recurvata* Branson and Mehl, lateral view, hypotypes (UC 38885, 38886). (p. 391)
- 58—*Ligonodina oliga* Cooper, n. sp., lateral view, holotype (UC 38883). (p. 391)
- 59—*Ligonodina cyra* Cooper, n. sp., lateral view, holotype (UC 38881). (p. 390)
- 62—*Prioniodus alatoides* Cooper, lateral view of cusp, hypotype (UC 39023). (p. 404)
- 63—*Prioniodus peculiaris* Branson and Mehl, lateral view of cusp, hypotype (UC 39045). (p. 406)
- 64—*Prioniodus culturatus* Ulrich and Bassler, lateral view of cusp, hypotype (UC 39035). (p. 405)



Cooper, Mississippian Conodonts



Cooper, Mississippian Conodonts

SPATHODUS REGULARIS Branson
and Mehl

Plate 45, figure 38

Hypotype, Walker Museum, Univ. Chicago, no. 39824.

Spathodus regularis BRANSON AND MEHL, 1938,
Missouri Univ. Studies, vol. 13, no. 4, pt. 2,
p. 137, pl. 34, figs. 1, 3.Figure 2 of plate 34, Branson and Mehl
(1938), seems to be a separate and distinct
species from figures 1 and 3.SPATHODUS MACRODUS Cooper, n. sp.
Plate 45, figure 23Tooth small, with a small number of rela-
tively large denticles; escutcheon wide,
deep and subcentral.

EXPLANATION OF PLATE 46

All lateral views, except as noted. Magnification $\times 18$. Specimens from the pre-Weldens shale,
lower Mississippian, south-central Oklahoma. (UC—University of Chicago.)

- FIGS. 1, 2—*Prioniodus choneutus* Cooper, n. sp.; 1, holotype (UC 39030); 2, paratype (UC 39031).
(p. 405)
- 3, 16—*Euprioniodina aphanes* Cooper, n. sp.; 3, holotype (UC 38824); 16, paratype (UC 38825).
(p. 387)
- 4—*Euprioniodina asema* Cooper, n. sp., holotype (UC 38826).
(p. 387)
- 5—*Euprioniodina* sp., (UC 39862).
- 6, 8—*Prioniodus alatus* Hinde, hypotypes (UC 39026, 39027).
(p. 404)
- 7—*Prioniodus peracutus* Hinde, hypotype (UC 39046).
(p. 406)
- 9–11, 63, 71—*Prioniodus oligus* Cooper, n. sp.; 9–11, 71, paratypes (UC 39038–39040); 63,
holotype (UC 39041).
(p. 405)
- 12—*Prioniodus concavus* Ulrich and Bassler, hypotype (UC 39032).
(p. 405)
- 13—*Prioniodus englyphus* Cooper, n. sp., holotype (UC 39035).
(p. 405)
- 14—*Euprioniodina gracilis* Branson and Mehl, hypotype (UC 38827).
(p. 387)
- 15, 23, 29—*Hindeodella acuta* Branson and Mehl, hypotypes (UC 38856–38858).
(p. 389)
- 17, 18—*Prioniodus barbatus* Branson and Mehl, hypotypes (UC 39028, 39029).
(p. 405)
- 19—*Prioniodus alatoideus* Cooper, hypotype (UC 39024).
(p. 404)
- 20—*Synprioniodina leptus* Cooper, n. sp., holotype (UC 39851).
(p. 421)
- 21—*Synprioniodina plana* Holmes, hypotype (UC 39852).
(p. 421)
- 22—*Trichognathus curvidens* E. R. Branson, hypotype (UC 39856).
(p. 422)
- 24, 25—*Hindeodella gladiola* E. R. Branson, hypotypes (UC 38864, 38865).
(p. 389)
- 26—*Hindeodella elongata* Huddle, hypotype (UC 38863).
(p. 389)
- 27—*Hindeodella anomaloda* Cooper, n. sp., holotype (UC 38859).
(p. 389)
- 28, 31—*Hindeodella lineata* (Pander), hypotypes (UC 38867, 38868).
(p. 389)
- 30, 32, 37, 43—*Hindeodella* sp., (UC 39863–39866).
(p. 389)
- 33—*Hindeodella delicatula* Branson and Mehl, hypotype (UC 38860).
(p. 392)
- 34, 38—*Lonchodus simplex* (Pander), hypotypes (UC 38901, 38902).
(p. 392)
- 35—*Lonchodus convexus?* (Pander), hypotype (UC 38898).
(p. 389)
- 36—*Hindeodella aculeata* Huddle, hypotype (UC 38855).
(p. 392)
- 39—*Lonchodus ischnus* Cooper, n. sp., holotype (UC 38899).
(p. 392)
- 40, 41—*Lonchodus* sp., (UC 39867, 39868).
- 42—*Lonchodus parallelus* Cooper, n. sp., holotype (UC 38900).
(p. 392)
- 44, 67—*Microcoelodus asymmetricus* Branson and Mehl, hypotypes (UC 38923, 38924).
(p. 396)
- 45, 49—*Trichognathus separata* Branson and Mehl hypotypes (UC 39859, 39860).
(p. 422)
- 46—*Trichognathus oxyis* Cooper, n. sp., holotype (UC 39858).
(p. 422)
- 47—*Trichognathus micra* Cooper, n. sp., holotype (UC 39857).
(p. 422)
- 48—*Trichognathus brevitata* Branson and Mehl, posterior view, hypotype (UC 39855).
(p. 421)
- 50—*Trichognathus toma* Cooper, n. sp., holotype (UC 39861).
(p. 422)
- 51—*Prioniodus* sp., (UC 39869).
- 52—*Neocordylodus cyclus* Cooper, n. sp., holotype (UC 38944).
(p. 397)
- 53, 59, 60, 66, 72—*Neocordylodus orthus* Cooper, n. sp.; 53, holotype (UC 38929); 59, 60, 66, 72,
paratypes (UC 38930–38933).
(p. 396)
- 54—*Neocordylodus alcus* Cooper, n. sp., holotype (UC 38936).
(p. 397)
- 55—*Microcoelodus oklahomensis* Cooper, n. sp., holotype (UC 38925).
(p. 396)
- 56—*Lonchodina?* sp., cusp of questionable form, (UC 39870).
- 57, 58, 65—*Microcoelodus scolops* Cooper, n. sp.; 57, holotype (UC 39826); paratypes (UC 38927, 38928).
(p. 396)
- 61—*Pteroconus?* *neossus* Cooper, n. sp., holotype (UC 39067).
(p. 409)
- 62—*Neocordylodus macrodus* Cooper, n. sp., holotype (UC 38948).
(p. 397)
- 64, 70, 73—*Neocordylodus* sp., (UC 39871–39873).
- 68—*Pteroconus?* *bicyrus* Cooper, n. sp., holotype (UC 39066).
(p. 409)
- 69—*Lonchodina distans* Huddle, hypotype (UC 38893).
(p. 392)

Holotype, Walker Museum, Univ. Chicago, no. 39825.

SPATHODUS MICRUS Cooper, n. sp.
Plate 45, figure 34

Tooth straight; denticles equal in length, very short and somewhat more discrete than average; escutcheon very long.

Holotype, Walker Museum, Univ. Chicago, no. 39826.

SPATHODUS ORTHUS Cooper, n. sp.
Plate 47, figure 32

Tooth small, thin, with short, wide erect denticles; escutcheon very deep.

Holotype, Walker Museum, Univ. Chicago, no. 39827.

SPATHODUS PARVIFOSSATUS
Branson and Mehl
Plate 45, figure 31

Spathodus parvifossatus BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 274, pl. 22, fig. 14.

Tooth long, bowed slightly; denticles long and of unequal width, largest over escutcheon, which is subcentral, wide and deep.

Hypotype, Walker Museum, Univ. Chicago, no. 39828.

SPATHODUS STRIGILIS Huddle
Plate 45, figure 37

Spathodus strigilis HUDDLE, 1934, Bull. Am. Paleontology, vol. 21, p. 275, pl. 7, fig. 15; pl. 12, fig. 11.

Tooth slightly bowed; bar wide; denticles of variable length and diameter, but largest on anterior end; wide escutcheon causes a prominent flaring near center of bar.

Hypotype, Walker Museum, Univ. Chicago, no. 39829.

SPATHODUS SULCIFERUS Branson
and Mehl
Plate 45, figures 17, 18

Spathodus sulciferus BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 274, pl. 22, figs. 12, 13.—E. R. BRANSON, 1934, *idem.*, p. 304, pl. 27, figs. 15, 20, 22.

Tooth straight, with largest denticles on anterior end, grading regularly to the smallest on the opposite end; aboral edge narrow except for a prominent flaring due to a wide, shallow escutcheon.

Hypotypes, Walker Museum, Univ. Chicago, nos. 39830, 39831.

SPATHODUS TEXANUS (Roundy)
Plate 42, figures 63, 64

Gnathodus texanus ROUNDY, 1926, U. S. Geol. Survey, Prof. Paper 146, p. 12, pl. 2, figs. 7a-8b.

Bar wide, very thin, wider on anterior end, narrowing toward posterior end; escutcheon formed by a sudden flaring of the aboral side of the bar, with a large denticle-like node on the aboral side.

Hypotype, Walker Museum, Univ. Chicago, no. 39819.

Genus *SUBBRYANTODUS* Branson
and Mehl, 1934

SUBBRYANTODUS ANGULATUS (Cooper)
Plate 45, figures 11, 12, 15, 16

Bryantodus angulatus COOPER, 1931, Jour. Paleontology, vol. 5, p. 233, pl. 28, fig. 8.

Subbryantodus cornutus E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 328, pl. 28, fig. 16.

Tooth small, with an extreme development of the cusp, which is inclined at a sharp angle to the denticles; escutcheon very deep.

Hypotypes, Walker Museum, Univ. Chicago, nos. 39833, 39834.

SUBBRYANTODUS ARAIUS Cooper, n. sp.
Plate 43, figures 39, 40

Bar narrow but thick, arched and set with long, round, slender, tapering denticles; aboral groove well formed.

Holotype, Walker Museum, Univ. Chicago, no. 39835.

SUBBRYANTODUS ARCUATUS
Branson and Mehl

Plate 45, figures 13, 14, 21, 22

Subbryantodus arcuatus BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 286, pl. 23, figs. 10, 11.

Tooth strongly arched, cusp much larger than denticles and subparallel to them; escutcheon large.

Hypotypes, Walker Museum, Univ. Chicago, nos. 39837, 39838.

SUBBRYANTODUS AULUS Cooper, n. sp.
Plate 43, figures 22, 23

Bar about as wide as deep; posterior

denticles discrete, wide at base, tapering to a slender point; cusp similar in shape; aboral edge distinctly grooved.

Holotype, Walker Museum, Univ. Chicago, no. 39839.

SUBBRYANTODUS BREVIDENS (Huddle)

Plate 43, figures 10, 11

Bryantodus brevidens HUDDLE, 1934, Bull. Am. Paleontology, vol. 21, p. 258, pl. 3, figs. 1, 2.

Bar thick, subovate in cross section except near ends; denticles short, wide and pointed; cusp short; escutcheon narrow.

Hypotype, Walker Museum, Univ. Chicago, no. 39840.

SUBBRYANTODUS CAMARATUS

Cooper, n. sp.

Plate 43, figures 41, 42

Bar strongly arched and curved laterally, carrying large pointed denticles; cusp very long, very wide at the base, tapering to a narrow point.

Holotype, Walker Museum, Univ. Chicago, no. 39836.

SUBBRYANTODUS ETHYS

Cooper, n. sp.

Plate 43, figure 15

Bar long, straight; denticles fused, posterior ones longest; cusp strongly inclined and gradually tapering to a point.

Holotype, Walker Museum, Univ. Chicago, no. 39841.

SUBBRYANTODUS ORTHUS Cooper, n. sp.

Plate 43, figure 12

Bar very slightly arched; cusp small, subcentral; denticles fused except for tips; escutcheon very small.

Holotype, Walker Museum, Univ. Chicago, no. 39842.

SUBBRYANTODUS PULCHER

E. R. Branson

Plate 47, figure 65

Subbryantodus pulcher E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 327, pl. 28, fig. 7.

Bar arched, with large discrete, rounded denticles; cusp long; escutcheon wide.

Hypotype, Walker Museum, Univ. Chicago, no. 39843.

SUBBRYANTODUS RADINUS

Cooper, n. sp.

Plate 43, figure 13

Bar very thin, slender, slightly arched and curved laterally; denticles large, oval in cross section; cusp shaped like denticles and long; escutcheon very small.

Holotype, Walker Museum, Univ. Chicago, no. 39844.

SUBBRYANTODUS? SCITULUS

(Branson and Mehl)

Plate 43, figures 35, 36

Bryantodus scitulus BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 283, pl. 23, fig. 5.

Bar arched, thin; denticles pointed, laterally compressed; cusp inclined, parallel to denticles and of same shape.

Hypotype, Walker Museum, Univ. Chicago, no. 39845.

SUBBRYANTODUS? STENUS

Cooper, n. sp.

Plate 43, figures 37, 38

Bar narrow, slightly arched; denticles short and wide, those behind cusp more pointed; escutcheon long and narrow.

Holotype, Walker Museum, Univ. Chicago, no. 39846.

Genus SYNPRIONIODINA Ulrich and

Bassler, 1926

SYNPRIONIODINA ACLIS Huddle

Plate 47, figure 22

Synprioniodina aclis HUDDLE, 1934, Bull. Am. Paleontology, vol. 21, p. 241, pl. 11, fig. 7.

Bar thin, slightly curved laterally and set with closely-spaced round denticles; cusp inclined sharply forward; projection short and denticulate.

Hypotype, Walker Museum, Univ. Chicago, no. 39847.

SYNPRIONIODINA ALTERNATA

Ulrich and Bassler

Plate 47, figures 18, 19

Synprioniodina alternata ULRICH AND BASSLER, 1926, U. S. Nat. Mus., Proc., vol. 68, art. 12, p. 42, text fig. 22.—HOLMES, 1928, idem., vol. 72, art. 5, p. 30, pl. 10, figs. 11, 12.—COOPER, 1931, Jour. Paleontology, vol. 5, p. 149, pl. 20, fig. 13; 1935, idem., vol. 9, p. 310, pl. 27, fig. 35.

Hindeodella curvata? BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 280, pl. 22, figs. 25, 27.

Bar wide but thin, with fused denticles alternating in size; cusp inclined sharply forward; projection thin, with fused denticles.

Hypotypes, Walker Museum, Univ. Chicago, nos. 39848, 39849.

SYNPRIONIODINA CYCLUS Cooper, n.sp.

Plate 47, figure 16

Bar straight and wide, with long round, slender denticles; cusp strongly inclined forward; projection thin.

EXPLANATION OF PLATE 47

All lateral views except as noted. Magnification $\times 18$. Specimens from the pre-Weldens shale, lower Mississippian, south-central Oklahoma. (UC—University of Chicago.)

- Figs. 1, 2—*Neocordylodus colbus* Cooper, n. sp., 1, holotype (UC 38946); 2, paratype (UC 38947). (p. 397)
- 3—*Neocordylodus exochus* Cooper, n. sp., holotype (UC 38945). (p. 397)
- 4, 14—*Neocordylodus orthus* Cooper, n. sp., paratypes (UC 38934, 38935). (p. 396)
- 5, 11, 13—*Neocordylodus* sp., (UC 39874–39876). (p. 397)
- 6–9, 38, 39—*Neocordylodus alcus* Cooper, n. sp.; 6, 8, 9, 38, 39, paratypes (UC 39837, 39839–39842); 7, holotype, (UC 39838). (p. 397)
- 10—*Neocordylodus apalus* Cooper, n. sp., holotype (UC 38943). (p. 397)
- 12—*Neocordylodus macrodus* Cooper, n. sp., paratype (UC 38949). (p. 397)
- 15—Projection of *Ligonodina* sp., with denticles; bar attached to lower left corner, (UC 39877). (p. 397)
- 16—*Synprioniodina cyclus* Cooper, n. sp., holotype (UC 39850). (p. 418)
- 17, 24, 33, 35, 53—*Falcodus fragosus* (E. R. Branson) hypotypes (UC 38836–38840). (p. 387)
- 18, 19—*Synprioniodina alternata* Ulrich and Bassler, hypotypes (UC 39848, 39849). (p. 417)
- 20, 21—*Prioniodus oligus* Cooper, n. sp., paratypes (UC 39043, 39044). (p. 405)
- 22—*Synprioniodina acilis* Huddle, hypotype (UC 39847). (p. 417)
- 23—*Euprioniodina* sp., (UC 39878). (p. 417)
- 25—*Falcodus typherus* Cooper, n. sp., holotype (UC 38841). (p. 387)
- 26, 34, 42, 43, 45, 46, 52—*Falcodus conflexus* Huddle, hypotypes (UC 38829–38835). (p. 387)
- 27, 36—*Ligonodina brevipostica* Branson and Mehl, hypotypes (UC 38874, 38875). (p. 390)
- 28—*Trichognathus* sp., (UC 39879). (p. 390)
- 29—*Telumodina gracilis* Cooper, hypotype (UC 39854). (p. 421)
- 30—*Apatognathus? varians* Branson and Mehl, hypotype (UC 38802). (p. 385)
- 31, 77—*Hindeodella echinata* E. R. Branson, hypotypes (UC 38861, 38862). (p. 389)
- 32—*Spathodus orthus* Cooper, n. sp., holotype (UC 39827). (p. 416)
- 37—*Telumodina apalus* Cooper, n. sp., holotype (UC 39853). (p. 421)
- 40—*Icriodus derus* Cooper, n. sp., holotype (UC 38869). (p. 390)
- 41, 47, 56, 57—*Lonchodina microcyra* Cooper, n. sp., endo- and exopleural views; 41, 47, paratype (UC 38894); 56, 57, holotype (UC 38895). (p. 392)
- 44—*Palmatodella paridens* Huddle, hypotype (UC 38958). (p. 398)
- 48, 49—*Oligodus curtus* Cooper, n. sp., aboral and lateral views of the holotype (UC 38955). (p. 398)
- 50, 51, 71, 72—*Lonchodina discreta* Ulrich and Bassler, endo- and exopleural views, hypotypes (UC 38891, 38892). (p. 391)
- 54—*Lonchodina angulata* Cooper, hypotype (UC 38889). (p. 391)
- 55—*Ligonodina transitionis* (Branson and Mehl), hypotype (UC 38888). (p. 391)
- 58, 59—*Lonchodina pulchra* Branson and Mehl, endo- and exopleural views, hypotype (UC 38896). (p. 392)
- 60, 61, 73, 74—*Icriodus? tylus* Cooper, n. sp., oral and aboral views; 60, 61, holotype (UC 38870); 73, 74, paratype (UC 38871). (p. 390)
- 62—Aboral view of two undetermined genera fused together, (UC 39880). (p. 390)
- 63, 75, 76—*Dinodus leptus* Cooper, n. sp.; 63, 76, paratypes (UC 38814, 38816); 75, holotype (UC 38815). (p. 386)
- 64—*Prioniodus magnus* Cooper, n. sp., holotype (UC 39034). (p. 405)
- 65—*Subbryantodus pulcher* E. R. Branson, hypotype (UC 39043). (p. 417)
- 66—*Euprioniodina isa* Cooper, n. sp., holotype (UC 38828). (p. 387)
- 67, 68—*Lonchodina curvidens* E. R. Branson, hypotype (UC 38890). (p. 391)
- 69, 70—*Lonchodina separata* Branson and Mehl, endo- and exopleural views, hypotype (UC 38897). (p. 392)
- 78—*Angulodus* cf. *spissus* Huddle, hypotype (UC 38801). (p. 385)
- 79, 80—*Hindeodella hamata* Branson and Mehl, hypotype (UC 38866). (p. 389)
- 81—*Chirognathus neossa* Cooper, n. sp., holotype (UC 38813). (p. 386)
- 82—*Subbryantodus* sp., (UC 39881). (p. 386)



Cooper, Mississippian Conodonts

CHART SHOWING SPECIES OF CONODONTS FROM THE PRE-WELDEN SHALE REPORTED
FROM OTHER FORMATIONS

	Grassy Creek	Hanni- bal	Bush- berg	Upper New Albany	Others*
<i>Angulodus</i> cf. <i>spissus</i> Huddle.....	—	—	—	x	—
<i>Apatognathus</i> ? <i>varians</i> Branson and Mehl.....	x	—	—	—	—
<i>Bryantodus flexus</i> Branson and Mehl.....	—	—	x	—	—
<i>Bryantodus macer</i> Branson and Mehl.....	—	—	x	—	—
<i>Bryantodus mundus</i> Branson and Mehl.....	—	—	x	—	—
<i>Bryantodus planus</i> Branson and Mehl.....	—	—	x	—	—
<i>Elictognathus bialata</i> (Branson and Mehl).....	—	—	x	—	—
<i>Euprioniodina gracilis</i> Branson and Mehl.....	x	—	—	—	—
<i>Falcodus conflexus</i> Huddle.....	x	—	—	x	—
<i>Falcodus fragosus</i> (E. R. Branson).....	—	x	—	—	—
<i>Gnathodus bilineatus</i> Roundy.....	—	—	—	—	2
<i>Gnathodus mosquensis</i> Pander.....	—	—	—	—	5, 8
<i>Gnathodus texanus</i> Roundy.....	—	—	—	—	2
<i>Hindeodella aculeata</i> Huddle.....	—	—	—	x	—
<i>Hindeodella acuta</i> Branson and Mehl.....	x	—	—	—	—
<i>Hindeodella anomalodus</i> Cooper.....	x	—	—	—	—
<i>Hindeodella delicatula</i> Branson and Mehl.....	—	—	x	—	—
<i>Hindeodella echinata</i> E. R. Branson.....	—	x	—	—	—
<i>Hindeodella elongata</i> Huddle.....	—	—	—	x	—
<i>Hindeodella gladiola</i> E. R. Branson.....	—	x	—	—	—
<i>Hindeodella</i> ? <i>hamata</i> Branson and Mehl.....	—	—	x	—	—
<i>Hindeodella lineata</i> (Pander).....	—	—	—	—	2, 5, 6
<i>Ligonodina arcuatus</i> (Branson and Mehl).....	—	—	x	—	—
<i>Ligonodina brevipostica</i> Branson and Mehl.....	—	—	x	—	—
<i>Ligonodina condens</i> Huddle.....	—	—	—	x	—
<i>Ligonodina delicatula</i> Branson and Mehl.....	x	—	—	—	—
<i>Ligonodina flexuosa</i> Branson and Mehl.....	x	—	—	—	—
<i>Ligonodina recurvata</i> Branson and Mehl.....	x	—	—	—	—
<i>Ligonodina transitionis</i> (Branson and Mehl).....	—	—	x	—	—
<i>Lonchodina angulata</i> Cooper.....	—	x	—	—	7
<i>Lonchodina curvidens</i> E. R. Branson.....	—	x	—	—	—
<i>Lonchodina discreta</i> Ulrich and Bassler.....	—	x	—	—	1, 3, 4
<i>Lonchodina distans</i> Huddle.....	—	—	—	x	—
<i>Lonchodina pulchra</i> Branson and Mehl.....	x	—	—	—	—
<i>Lonchodina separata</i> Branson and Mehl.....	—	—	x	—	—
<i>Lonchodus convexus</i> ? (Pander).....	—	—	—	—	5, 6
<i>Lonchodus simplex</i> (Pander).....	—	—	—	—	2, 5
<i>Microcoelodus asymmetricus</i> Branson and Mehl..	—	—	—	—	x
<i>Nodognathus linguifera</i> (E. R. Branson).....	—	x	—	—	—
<i>Palmatodella paridens</i> Huddle.....	—	—	—	x	—
<i>Pinacodus profundus</i> Branson and Mehl.....	—	—	x	—	—
<i>Pinacodus subbrevis</i> (Ulrich and Bassler).....	—	—	—	—	4
<i>Polygnathus angusta</i> Branson and Mehl.....	x	—	—	—	—

* The figures in the last column refer to scattered occurrences, as follows: (1) Arkansas novaculite, Arkansas; (2) Barnett shale, Texas; (3) Chattanooga shale, Alabama; (4) Hardin sandstone, Tennessee; (5) Carboniferous, Russia; (6) Carboniferous, Scotland; (7) Woodford shale, Oklahoma; (8) Genesee shale, Ontario; and (9) Chouteau limestone, Missouri.

CHART SHOWING SPECIES OF CONODONTS FROM THE PRE-WELDEN SHALE REPORTED
FROM OTHER FORMATIONS—*Continued*

	Grassy Creek	Hanni- bal	Bush- berg	Upper New Albany	Others*
<i>Polygnathus communis</i> Branson and Mehl.	—	x	x	—	—
<i>Polygnathus crucifera</i> E. R. Branson.	—	x	—	—	—
<i>Polygnathus delicatula</i> Ulrich and Bassler.	—	—	—	—	1, 4
<i>Polygnathus flabellum</i> Branson and Mehl.	—	—	—	—	9
<i>Polygnathus inornata</i> E. R. Branson.	—	x	x	—	—
<i>Polygnathus lacinata</i> Huddle.	—	—	—	x	—
<i>Polygnathus longipostica</i> Branson and Mehl.	—	x	x	—	—
<i>Polygnathus lobata</i> Branson and Mehl.	—	—	—	—	9
<i>Polygnathus marginata</i> Branson and Mehl.	—	—	x	—	—
<i>Polygnathus permarginata</i> E. R. Branson.	—	x	—	—	—
<i>Polygnathus perplana</i> E. R. Branson.	—	x	—	—	—
<i>Polygnathus scapha</i> Huddle.	—	—	—	x	—
<i>Polygnathus scobiniformis</i> E. R. Branson.	—	x	—	—	—
<i>Polygnathus semicostata</i> Branson and Mehl.	—	—	x	—	—
<i>Polygnathus spicata</i> E. R. Branson.	—	x	—	—	—
<i>Polygnathus subserata</i> Branson and Mehl.	—	—	x	—	—
<i>Prioniodus alatoideus</i> Cooper.	—	—	—	—	7
<i>Prioniodus alatus</i> Hinde.	—	—	—	—	4, 8
<i>Prioniodus barbatus</i> Branson and Mehl.	—	—	x	—	—
<i>Prioniodus concavus</i> Ulrich and Bassler.	—	—	—	—	4
<i>Prioniodus culturatus</i> Ulrich and Bassler.	—	—	—	—	1, 3, 4
<i>Prioniodus mutabilis</i> Branson and Mehl.	x	—	—	—	—
<i>Prioniodus oligus</i> Cooper.	—	—	—	—	2
<i>Prioniodus peculiaris</i> Branson and Mehl.	—	—	x	—	—
<i>Prioniodus peracutus</i> Hinde.	—	—	—	—	2, 6
<i>Pseudopolygnathus asymmetrica</i> E. R. Branson. .	—	x	—	—	—
<i>Pseudopolygnathus crenulata</i> E. R. Branson.	—	x	—	—	—
<i>Pseudopolygnathus distorta</i> E. R. Branson.	—	x	—	—	—
<i>Pseudopolygnathus fusiformis</i> Branson and Mehl. .	—	—	x	—	—
<i>Pseudopolygnathus irregularis</i> E. R. Branson.	—	x	—	—	—
<i>Pseudopolygnathus lobata</i> E. R. Branson.	—	x	—	—	—
<i>Pseudopolygnathus prima?</i> Branson and Mehl.	—	—	x	—	—
<i>Pseudopolygnathus projecta</i> E. R. Branson.	—	x	—	—	—
<i>Pseudopolygnathus varicostata</i> E. R. Branson.	—	x	—	—	—
<i>Siphonognathus lobata</i> Branson and Mehl.	—	—	x	—	—
<i>Siphonognathus newalbanyensis</i> (Huddle).	—	—	—	x	—
<i>Siphonognathus quadruplicata</i> Branson and Mehl. .	—	—	x	—	—
<i>Siphonognathus sexplicata</i> Branson and Mehl.	—	—	x	—	—
<i>Solenognathus camura</i> (Huddle).	—	—	—	x	—
<i>Solenognathus carinata</i> (Cooper).	—	—	—	—	1
<i>Solenognathus costata</i> E. R. Branson.	—	x	—	—	—
<i>Solenognathus dicrocheila</i> E. R. Branson.	—	x	—	—	—
<i>Solenognathus fulcrum</i> Branson and Mehl.	—	—	x	—	—
<i>Solenognathus lacerata</i> Branson and Mehl.	—	—	x	—	—
<i>Solenognathus tabulata</i> Branson and Mehl.	—	—	x	—	—
<i>Solenognathus tenera</i> E. R. Branson.	—	x	—	—	—
<i>Spathodus abnormis</i> Branson and Mehl.	—	x	x	—	—
<i>Spathodus acidentatus</i> E. R. Branson.	—	x	—	—	—
<i>Spathodus elongatus</i> Branson and Mehl.	—	—	—	—	9
<i>Spathodus crassidentatus</i> Branson and Mehl.	—	x	x	x	—
<i>Spathodus delicatulus</i> E. R. Branson.	—	x	—	—	—
<i>Spathodus parvifossatus</i> Branson and Mehl.	—	—	x	—	—
<i>Spathodus regularis</i> Branson and Mehl.	—	—	—	—	9
<i>Spathodus strigilis</i> Huddle.	—	—	—	x	—
<i>Spathodus sulciferus</i> Branson and Mehl.	—	x	x	—	—

CHART SHOWING SPECIES OF CONODONTS FROM THE PRE-WELDEN SHALE REPORTED FROM OTHER FORMATIONS—Continued

	Grassy Creek	Hanni- bal	Bush- berg	Upper New Albany	Others*
<i>Spathodus texanus</i> (Roundy).....	—	—	—	—	2
<i>Subbryantodus angulatus</i> (Cooper).....	—	x	—	—	7
<i>Subbryantodus brevidens</i> (Huddle).....	—	—	—	x	—
<i>Subbryantodus pulcher</i> E. R. Branson.....	—	x	—	—	—
<i>Subbryantodus? scitulus</i> (Branson and Mehl).....	—	—	x	—	—
<i>Synprioniodina acilis</i> Huddle.....	—	—	—	x	—
<i>Synprioniodina alternata</i> Ulrich and Bassler.....	—	—	x	—	3, 4
<i>Synprioniodina plana</i> Holmes.....	—	—	—	x	3
<i>Telumodina gracilis</i> Cooper.....	—	—	—	—	7
<i>Trichognathus brevia lata</i> Branson and Mehl.....	—	—	x	—	—
<i>Trichognathus curvidens</i> E. R. Branson.....	—	x	—	—	—
<i>Trichognathus separata</i> Branson and Mehl.....	—	—	x	—	—

Holotype, Walker Museum, Univ. Chicago, no. 39850.

SYNPRIONIODINA LEPTUS Cooper, n. sp.
Plate 46, figure 20

Bar thin and narrow; denticles long, slender and of equal size; cusp wide, flat and sharp-edged; projection wide, with denticles curved upward; entire tooth warped.

Holotype, Walker Museum, Univ. Chicago, no. 39851.

SYNPRIONIODINA PLANA Holmes
Plate 46, figure 21

Synprioniodina plana HOLMES, 1928, U. S. Nat. Mus. proc., vol. 72, art. 5, p. 30, pl. 10, fig. 13.
—HUDDLE, 1934, Bull. Am. Paleontology, vol. 21, p. 240, pl. 6, fig. 12; pl. 11, fig. 10.

Bar thin; denticles inserted, partly fused and alternating in size; cusp short, massive at base, sharp edged, and sharply inclined forward; projection tapering and denticulate on anterior margin.

Hypotype, Walker Museum, Univ. Chicago, no. 39852.

Genus *TELMODINA* Cooper, 1931

TELMODINA APALUS Cooper, n. sp.
Plate 47, figure 37

Bar and projection denticulate with very small, delicate teeth, those on the bar greatly inclined; cusp horizontal and sharp-edged.

Holotype, Walker Museum, Univ. Chicago, no. 39853.

TELMODINA GRACILIS Cooper
Plate 47, figure 29

Telumodina gracilis COOPER, 1931, Jour. Paleontology, vol. 5, p. 242, pl. 28, fig. 33.

Bar slender, finely denticulate; cusp horizontal; projection very thin.

Hypotype, Walker Museum, Univ. Chicago, no. 39854.

Genus *TRICHOGNATHUS* Branson
and Mehl, 1934

TRICHOGNATHUS BREVIA TATA
Branson and Mehl
Plate 46, figure 48

Trichognathus brevia lata BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 291, pl. 23, fig. 29.

Bar very slender, with thin widely spaced denticles; cusp upright and slightly curved.

Hypotype, Walker Museum, Univ. Chicago, no. 39855.

TRICHOGNATHUS CURVIDENS
E. R. Branson
Plate 46, figure 22

Trichognathus curvidens E. R. BRANSON, 1934, Missouri Univ. Studies, vol. 8, p. 329, pl. 28, fig. 4.

Bar thin, delicate; projections of about equal weight, longitudinally grooved; cusp curved backward.

Hypotype, Walker Museum, Univ. Chicago, no. 39856.

TRICHOGNATHUS MICRA

Cooper, n. sp.

Plate 46, figure 47

Bar thin, somewhat wide with numerous slender, closely spaced denticles; cusp flat and at right angles to the bar.

Holotype, Walker Museum, Univ. Chicago, no. 39857.

TRICHOGNATHUS OXYS Cooper, n. sp.

Plate 46, figure 46

Cusp thick and massive at the base, tapers rapidly and strongly curved; anterior process prominent with round sharp-pointed denticles.

Holotype, Walker Museum, Univ. Chicago, no. 39858.

TRICHOGNATHUS SEPARATA

Branson and Mehl

Plate 46, figures 45, 49

Trichognathus separata BRANSON AND MEHL, 1934, Missouri Univ. Studies, vol. 8, p. 290, pl. 23, fig. 30.

Cusp curved; bar wide, with aboral edge distinctly grooved; anterior processes carry several denticles.

Hypotypes, Walker Museum, Univ. Chicago, nos. 39859, 39860.

TRICHOGNATHUS TOMA Cooper, n. sp.

Plate 46, figure 50

Bar slender; anterior process small and delicate; cusp round at base, becoming flat transversely and sharp-edged toward the tip.

Holotype, Walker Museum, Univ. Chicago, no. 39861.

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